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ABSTRACT

This study is based on a total population of about 6,200 graduates of electronics and drafting design curriculums from each of the years 1955-1969. Thirty-three percent of this population was selected in a stratified random manner. The factors considered in this portion of the study deal with the judgmental values of the respondents for the four basic courses and twelve specialized topics for each curriculum. The judgments concerned: (1) quality of instruction, (2) need for coursework immediately after graduation, (3) need for coursework now, and (4) anticipated need of basic courses for future jobs. These data are graphically displayed to show the relationships between the judgments and the number of years since graduation. It was found that judgments relative to certain courses and topics varied in terms of years after graduation. Specific trends are given detailed treatment in the appropriate sections. Related documents are available as VT 012 725 and VT 013 460. (Author/GEB)

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ASSOCIATE DEGREE TECHNICIANS' JUDGEMENTS ON QUALITY OF INSTRUCTION AND COURSE RELEVANCY

ANGELO C. GILLIE

VOCATIONAL – INDUSTRIAL EDUCATION **Research Report**

FEBRUARY 1971

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ASSOCIATE DEGREE TECHNICIANS' JUDGMENTS

QUALITY OF INSTRUCTION AND COURSE RELEVANCY

Angelo C. Gillie

The research reported herein was partially supported by The Center for the Study of Higher Education (P.S.U.), the Department of General Engineering (College of Engineering), and the Bureau of Vocational, Technical, and Continuing Education (State Department of Education, Commonwealth of Pennsylvania).

Department of Vocational Education
The Pennsylvania State University
University Park, Pennsylvania

February 1971

Errata sheet on the research report,

"ASSOCIATE DEGREE TECHNICIANS' JUDGEMENTS
ON QUALITY OF INSTRUCTION AND COURSE RELEVANCY"

by

A. C. Gillie, Department of Vocational Education

The 15 YEAR MEANS in the chapter "Need for Coursework Now" are in error. The following corrections should be made.

Page	Reads	Should Read
69 (EET)	2.20	2.12
69 (DDT)	1.87	1.79
70 (EET)	2.49	2.46
70 (DDT)	2.68	2.56
71 (EET)	2.33	2.07
71 (DDT)	2.39	2.04
72 (EET)	3.16	2.93
72 (DDT)	3.16	2.91
73 (DDT	2.60	2.30
73 (DDT)	2.13	2.43
74 (DDT)	3.08	2.98
74 (DDT)	3.32	3.19
75 (DDT)	2.86	2.62
75 (DDT)	3.17	2.90
76 (DDT)	3.32	3.07
76 (DDT)	3.19	2.97
77 (DDT)	2.93	2.53
77 (DDT)	2.89	2.62
78 (DDT)	3.21	2.42
78 (DDT)	3.77	3.40
79 (EET)	3.17	3.36
79 (EET)	2.83	2.53
80 (EET)	3.34	2.75
80 (EET)	2.30	2.38
81 (EET)	3.10	2.92
81 (EET)	3.20	2.79
82 (EET)	3.27	3.19
82 (EET)	3.03	2.92
83 (EET)	3.59	3.51
83 (EET)	2.40	2.37
84 (EET)	3.26	2.91
84 (EET)	3.48	3.17

ACKNOWLEDGEMENTS

Several individuals have made meaningful contributions to the findings reported herein. Initial encouragement and advice was provided by Dr. Joseph T. Impellitteri, Chairman of Graduate Studies and Research of the Department of Vocational Education. Mr. Ernest R. Weidhaas, Assistant Dean of Commonwealth Campuses, provided assistance in establishing communications with key faculty and administrators in the various campuses of the University. Special thanks are also given to Dr. Curtis R. Finch and Mr. Jerome T. Kapes for their advice relating to treatment of the data and to Mr. Thomas Turnbaugh for the preparation of the many graphs. The author also wishes to express his appreciation to the various faculty and administrators who were so helpful with suggestions during the questionnaire design and pretesting phase.

The major financial support for this study was derived from the Department of Vocational Education. It should be mentioned that significant financial assistance was given by The Center for the Study of Higher Education of the University, and The Department of General Engineering. This effort was also supported by the Bureau of Vocational, Technical, and Continuing Education, Pennsylvania Department of Education.

The author is especially appreciative for the sustained efforts of Mr. Richard R. Olson and Mr. Edward D. Cory, who by and large were responsible for the collection of the data. Any errors which may appear in this report are those of the author.

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ABSTRACT

The study is based on a total population of about 6,200 graduates of electronics and drafting design curriculums from each of the years 1955-1969. Thirty-three percent of this population was selected in a stratified random manner. Fifty-three percent of our sample responded after a series of three follow-up letters. Eleven percent of the questionnaires were returned by the Post Office as being undeliverable. A ten percent random sample was taken from the remaining non-respondents for the purpose of comparing them with the original respondents. They were contacted by telephone, which resulted in an eighty-seven percent response from this group.

The pooled variance t-test was used to compare these two groups on 59 variables and it was found that the respondent group was not significantly different from the non-respondents. On that basis, inferences drawn from the respondents may be generalized to the entire sample.

The factors considered in this portion of the study deal with the judgmental values of the respondents for the four basic courses and twelve specialized topics for each curriculum. These judgments were:

a. Quality of Instruction

b. Need for Coursework Immediately After Graduation

c. Need for Coursework Now

d. Anticipated Need of Basic Courses for Future Jobs

These data are graphically displayed to show the relationships between the judgments and the number of years since graduation. This type of display enabled us to identify trends. It was found that judgments relative to certain courses and topics varied in terms of years after graduation. In some cases the older

graduation classes placed higher values on certain topics, and in some instances the opposite type of relationship was found. Specific trends are given detailed treatment in the appropriate sections. The last section of this report briefly discusses the interrelationships found by use of zero-order correlations.

Since one of the main purposes of this report is to present in descriptive form a substantial amount of information which was obtained from analyzing a large amount of data, heavy reliance has been placed on the utilization of tables and graphical displays.

INTRODUCTION

The majority of the associate degree enrollment at The Pennsylvania State University up to the present has been concentrated in its engineering technology programs. The Bulletin (1:4) describes the engineering technology graduate in the following manner:

> . . . a specialist in applied rather than theoretical engineering, is equipped to translate creative ideas into new machines, products, structures, and processes. He understands the basic scientific principles which are the tools and materials of the skilled worker. In addition to receiving an education preparing him for entering employment, he also may qualify for a program in Engineering Technology at the Capitol Campus which leads to the baccalaureate degree.

Therefore it is seen that the graduates of the program, while specializing in the applications aspect of some area in engineering, do have open for them the possibility of continuing on with further education to the baccalaureate degree. It should be pointed out that bachelor degree programs for graduates of associate degree technicians are already available in a rapidly growing number of four year colleges and universities throughout the country and Pennsylvania. Such four year programs are offered for certain specialities by Spring Garden College and Temple University.

This study has found that about 12 per cent of the EET graduates (78), and 10 per cent of the DDT graduates (57) have earned baccalaureate degrees or higher since 1955. In addition to this, although precise data is not available at this time, it is believed that many other graduates are somewhere along the "academic pipeline" between the associate and baccalaureate degrees.

The purpose of this report is to describe the judgmental statements of the graduates relative to the basic courses and a number of the specialized topics

in which they received instruction during their two-year program at one of the commonwealth campuses. The two programs considered in this study are described in the Bulletin (1:12-13) as follows:

DRAFTING AND DESIGN TECHNOLOGY

This major is intended to prepare detail or layout draftsmen and junior designers for manufacturing industries as well as for the many concerns engaged in installation or erection work. The principal objective is to prepare young men and women for employment in machine design, tool and die design, or structural layout.

ELECTRICAL AND ELECTRONICS TECHNOLOGY

This major is designed to prepare graduates for technological service with electrical utilities, manufacturers of electrical and electronic equipment, and electrical maintenance and instrument departments of various industrial concerns. The principal objective is to provide a practical knowledge of electrical machinery and its control, as well as of electronic theory and its application in communication and control systems.

The basic courses and specialized topics examined in this study are meant, as would be expected, to provide the student with certain academic knowledge and applications that would best prepare him for an occupation in his chosen field (DDT or EET). This publication reports the judgments of the respondents with regard to four factors for the basic courses and three factors for the specialized twelve topics for each curriculum.

The four basic courses were:

a. Mathematics

b. Science

c. English

d. Social Science

And the four judgmental responses were:

1. Quality of Instruction. The possible responses were: Excellent, Good, Fair, Poor, Not Taught.

2. Need for It After Graduation. The possible responses were: Very Much, Much, Some, None.

3. Your Need for It Now: Same responses as number 2.

4. Need for It to Get Desired Job in the Future. Same responses as number 2.

The specialized twelve topics for the DDT graduates were: Freehand sketching, multiview layout, graphical solutions, kinematics, strength of materials, static load analysis, analysis of structures, manufacturing process, product design, report writing, and computer programming.

The specialized twelve topics for the EET graduates were: vacuum tube theory, transistor circuit theory, integrated circuits, use of electronic test equipment, pulse circuits, logic circuits, communications circuits, industrial electronics circuits, microwave theory, trouble-shooting analysis, binary arithmetic, boolean algebra.

The respondents were asked to make three judgmental responses to their respective special topics; they were:

1. Quality of Instruction. The possible responses were:
   Excellent, Good, Fair, Poor, Not Taught.
2. Extent Used When First Graduated. The possible responses were:
   Very much, Much, Some, and None.
3. Extent Used Now. Same responses as number 2.

The "not taught" possibility was included within the judgmental response for Quality of Instruction for the twelve specialized topics of each program. It was included because there were several specialized topics that were not in the program for the entire fifteen year span covered by this study. Therefore, those respondents who graduated prior to the time a certain topic was included (such as transistor circuit theory, which was not in the EET program for several of the earlier years) had the opportunity to indicate this. When the responses were compiled and analyzed, the "not taught" responses were removed prior to the determination of the means. The topics that fell within this category are pointed out in later sections of this report.

THE SAMPLE AND SAMPLING STRATEGY

The population consisted of the associate degree graduates of the electrical-electronics technology (EET) and drafting design technology (DDT) programs of the Commonwealth Campuses of The Pennsylvania State University for the graduation years of 1955 through 1969 (inclusive). The entire population consisted of about 6,200 associate degree graduates. A ten-step stratified random sampling procedure (2:87-88) was used to obtain the sample from this entire population (the sampling strategy is illustrated in the flow diagram of Appendix VI). A random sample of thirty-three percent of the entire population was selected as our sample.

A follow-up letter was sent approximately every two weeks, for a total of three tries. Eleven percent of the questionnaires were returned by the postal authorities as undeliverable (See Appendix V). After a period of around six weeks from the time the questionnaire was first sent out, the second phase of our strategy was put into effect. The non-respondent group (excluding those returned by the Post Office Department) represented about 36% of the original sample and was given special treatment. A ten percent stratified random sample from this group was taken.* They were contacted either at home or at their place of employment by telephone. The approach was successful, as almost nine-tenths of the special telephone sample (87%) completed and returned their questionnaires (See Appendix VII). This

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*This actually became 12.7% because of rounding within each stratum.

provided us with some basis for statistically comparing the original respondents with the non-respondents (the assumption being made that the telephone respondents are typical of the non-respondent group since they were also selected in a random fashion).

Results: The original sample size was 2,098 associate degree graduates (1,100 DDT and 998 EET graduates). The sampling results were as follows:

1. About 230 questionnaires (11% of the entire sample) were returned by the postal authorities because the graduate had moved and no forwarding address was available;

2. About 1,100 (53% of the total) were completed and returned by the regular mailing and three follow-up letter strategy;

3. Ninty-seven graduates were selected for the telephone group (which represented 4.8% of the total sample). Eighty-four of them filled out and returned the questionnaire (a response rate of 87%).

Note: A brief explanation as to why it was felt that obtaining a high response rate from the telephone group was essential is in order. Since the persons in the telephone group were selected on a random basis, it could be assumed they would be representative of the non-respondent group. Comparing the questionnaire returns of this group with those of the original respondents would be an acceptable basis for examining these two groups (i.e. the original respondents and the telephone group) for similarities and differences.

Comparing the Original and the Telephone Follow-Up Groups: The questionnaire received from individuals in the two groups (regular respondents and the telephone group) were compared in order to identify any significant

differences in their responses.

In order to carry out the analysis, a pooled t-test (2:197-198) was used. One of the required assumptions of this test is that the variances of the two groups are equal. A casual inspection of the variances showed that they appeared to be approximately equal. It was assumed that the variances of the original group of respondents and the follow-up group were equal. If they were not equal (i.e. if the assumption is false) the result may be either an increase or a decrease in alpha. If the variances are equal the actual value of alpha (α) is equal to the value selected (i.e. $\alpha = .05$). If the variances are not equal the result is to increase or decrease alpha and therefore increase or decrease the probability of a type one error [in this case the chance of finding a difference between groups is either greater or less than alpha, (i.e. $\alpha \gtrless .05$)].

These two groups were tested for the following items:

1. First job salary
2. Number of miles between first job and hometown high school
3. Present job salary
4. Number of miles between present job and hometown high school
5. Number of times there has been a simultaneous job and residence change
6. Number of times there has been a simultaneous job change and change in company or business firm.
7. The graduates' judgmental responses to Quality of Instruction, Need for Coursework Immediately After Graduation, Need for Coursework Now, and Anticipated Need of Coursework for Future Jobs. There was a total of 48 items in this category.

A total of 59 t-tests were conducted for each of the three graduation groups in each curriculum, these six groups were:

EET	1955-59	1960-64	1965-69
DDT	1955-59	1960-64	1965-69

Having used about 60 t-tests for each of the groups, we would expect up to three items to be significantly different for a confidence level of .05 (α = .05). Only the 1965-69 DDT (with six items) and 1955-59 EET (with four items) groups fell outside these limits, and then only barely so. The conclusions drawn from conducting the t-tests is that the original respondents and the non-respondents were found to be the same in terms of responses to the questionnaire items. Having established this fact, we are now able to say that the characteristics found for the respondents are also applicable for the entire technician population of the study.

THE BASIC COURSES

In the earlier years (i.e. in the fifties), two courses in Mathematics were required of all students in the two curriculums. This was later increased to three courses (9 credit hours). The mathematics courses are in the "800" series, which are designed specifically for the associate degree programs and are not acceptable for transfer into the traditional baccalaureate programs in the university. These courses are named: Technical Mathematics (2 terms for a total of 6 credit hours) and Technical Calculus (3 credit hours). It should be pointed out that although these courses are not transferable into the traditional baccalaureate programs at The Pennsylvania State University, they are acceptable for transfer into bachelor of technology programs (including those offered by P.S.U. at its Capitol Campus).

Science courses consist of offerings in Physics. In the very early years no Physics was required of the associate degree students. Later, an "800" physics course was utilized. The present DDT curriculum includes two terms of the subject (Physics 150-151, Technical Physics for a total of six credit hours.) The EET curriculum includes Physics 800 (Elements of Physics), Engineering Mechanics 811 (Elementary Mechanics), Mechanical Engineering 800 (Mechanisms) for a total of nine credit hours.

Two terms of English are required in each program. There are several possible sequences, depending upon performance on an English Placement Test conducted by the English faculty. For those scoring average or below

on this test, the required courses are English 800 (English Usage) and English 1 (Composition and Rhetoric). Entering students placing high on the placement test are enrolled in English 1 as their first course in the subject, which is then followed by English 3 (The Writing of Ideas). DDT students have the option of selecting English 826 (Report Writing) for their second English course.

Both programs provide for a one term Social Science elective. Two courses of this type are listed in the Bulletin (1:39), they are: "800. Human Cultures and the Individual" (two terms for a total of six hours) and "801. Critical and Visionary Concepts of Society" (two terms for a total of six hours).

THE SPECIAL TOPICS*

As stated in the preceding section, several of the special topics were not a part of the respective programs over the entire fifteen year period which this study covers. These are now examined on a program basis.

DDT Program Topics: The only topic not incorporated in the DDT program during the fifteen year period of inquiry was "Computing Programming." This topic, received the "not taught" response by the graduates of 1955 through 1964 inclusive. It was ranked for Quality of Instruction in terms of Excellent, Good, Fair, Poor by the 1965 through 1969 graduates.

EET Program Topics: Indicative of the more substantial changes taking place in the area of Electronics is the fact that seven of the twelve topics were not in the curriculum for the entire fifteen year interval considered. They are:

1. Transistor Circuits: not taught to the graduation classes of 1955 through 1957;
2. Integrated Circuits: not taught to the graduation classes of 1955 through 1958;
3. Pulse Circuits: not taught to the graduation classes of 1955 through 1959;

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* The special topics included in the study were those proposed ~~and referred~~ by a group of faculty members and administrators of the commonwealth campuses. This was in response to a request from this writer prior to finalizing the content and design of the questionnaire. The final changes were made after a limited pretest.

4. Logic Circuits: not taught to the graduation classes of 1955 through 1959;
5. Microwave Theory: not taught to the graduation classes of 1955 through 1958;
6. Binary Arithmetic: not taught to the graduation classes of 1955 through 1958;
7. Boolean Algebra: not taught to the graduation classes of 1955 through 1959.

Therefore, the above seven topics were judged as to the Quality of Instruction for only a portion of the fifteen years.

QUALITY OF INSTRUCTION

The graduates were asked to make judgmental responses as to the quality of instruction, as they remember it, for the four basic courses and the twelve specialized topics of their curriculum. Since a number of the special topics were not in the curriculum over the entire fifteen year span, the graduates were given the opportunity to indicate that the material was "not taught" during the time he was enrolled. The "not taught" responses were extracted prior to the computation of the means. This did occur to a considerable degree with one of the special DDT topics and seven EET special topics.

The graduates graded the Quality of Instruction by checking one of four categories, i.e. excellent, good, fair, and poor (plus the not taught category mentioned earlier). These were later converted into numerical values for the purpose of computing means, the values were:

Excellent = 1;

Good = 2;

Fair = 3;

Poor = 4.

The means for each graduation group by curriculum are graphically displayed in figures 1 through 32. Tables of Means and Standard Deviations are found in Appendix I. It should be pointed out that the graphs are plotted in such a manner that the means indicating higher ratings (which are numerically smaller) are placed highest on the y-axis. Therefore the y-axis begins with 4.0 at the origin and numerically decreases to 1.0. The y-axis is subdivided into the three categories of excellent--good; good--fair; fair--poor (the terms to which the graduates responded to in the

questionnaire). The x-axis is marked off in number of years after graduation. Therefore "1" represents the graduation class of 1969 and "15" represents the graduation group of 1955.

The following paragraphs describe the findings for Quality of Instruction.

Basic Courses - DDT: The Quality of Instruction values assigned to the four basic courses by the DDT graduates over the 15 groups are displayed in Figures 2,4,6, and 8.

Mathematics: Quality of Instruction was rather consistently rated in the lower portion of the "excellent to good" region by all graduation groups. Although there was a substantial amount of variation on a year to year basis, the quality of instruction for Science was consistently rated in the upper regions of the "good to fair" category by most groups. A distinguishable upward trend, as a function of years after graduation, is found for English Quality of Instruction. The more recent graduation groups displayed means in the lower side of the "excellent to good" region. No discernable upward or downward trend was found for the Social Science Quality of Instruction, where all values fell within the "good to fair" region.

In conclusion: Only English displayed a change as a function of years after graduation in the values for Quality of Instruction. In this case, the older graduation classes rated it more highly. The other three courses did not display quality of instruction ratings that varied as a function of years after graduation.

Basic Courses - EET: The Quality of Instruction values assigned to the four basic courses by the graduates of the EET program over the fifteen years are displayed in Figures 1, 3, 5, and 7.

As was found with the DDT group, Mathematics Quality of Instruction received consistent values for the fifteen groups. The values ranged from the upper portion of the "good to fair" and lower portion of the "excellent to good" regions. There is no discernable upward or downward trend for Science Quality of Instruction either, with most group values falling in the upper portion of the "good to fair" region. There was a weak trend for the older groups to rate English Quality of Instruction higher than the more recent graduates. The values for most graduation groups hovered near the top of the "good to fair" category, although several of the earlier classes placed their values in the lower part of the "excellent to good" region. There was an observable downward trend for Social Science Quality of Instruction (i.e. the more recent graduation groups rated it more highly than the older classes). All values fell within the "good to fair" category.

Conclusion: Quality of Instruction values for Mathematics and Science did not vary as a function of years after graduation. The other two basic courses did, but in opposite ways. English Quality of Instruction was rated lower by the more recent graduates while Social Science Quality of Instruction was rated lower by the older graduation groups.

Twelve Special Topics - DDT: The Quality of Instruction values assigned to the twelve special DDT topics by the fifteen graduation groups are displayed in Figures 9 through 20. Tables of Means and Standard Deviations are found in Appendix I.

Quality of Instruction for Sketching received stable ratings by the fifteen graduation groups, with values in the upper portion of the "good to fair" region. A very slight downward trend was found for Layout Quality of Instruction, where most of the values for the fifteen groups were in the lower part of the "excellent to good" category. Quality of Instruction of Graphical Solutions remained stable, with values straddling the demarcation line between the "excellent to good" and "good to fair" categories. A distinguishable downward trend, as a function of years after graduation, was found for Kinematics Quality of Instruction. All values lied within the "good to fair" region.

Strength of Materials Quality of Instruction was relatively fixed over the fifteen year period with values straddling the boundary between the "excellent to good" and "good to fair" regions. A slight downward trend was found for Quality of Instruction of Static Analysis. Most ratings were in the upper part of the "good to fair" category. Slight downward trends were also observed for quality of instruction of Dynamic Analysis and Analysis of Structures. As a whole, these values were in the upper part of the "good to fair" region.

A downward trend was also found in Quality of Instruction for Product Design, again with values in the upper part of the "good to fair" region. Quality of Instruction for Manufacturing Processes display considerable variation within years but there was no overall discernable trend, with values lying within the "good to fair" category. An upward trend (i.e. higher ratings by the older graduation groups) was observed for Quality of Instruction for Report Writing. The entire trend was contained within the "good to fair" category, however. Quality of Instruction for Computer Programming, which was obtained for only the most recent five graduation groups, had values that hovered around the boundary of "fair to poor" and "good to fair."

In conclusion: An upward trend was found for Quality of Instruction of Report Writing. No observable rating changes as a function of graduation year was found for Quality of Instruction for Sketching, Graphical Solutions, Strength of Materials, Manufacturing Processes, and Computer Programming. The remaining topics had Quality of Instruction ratings that received lower ratings from the older graduation groups.

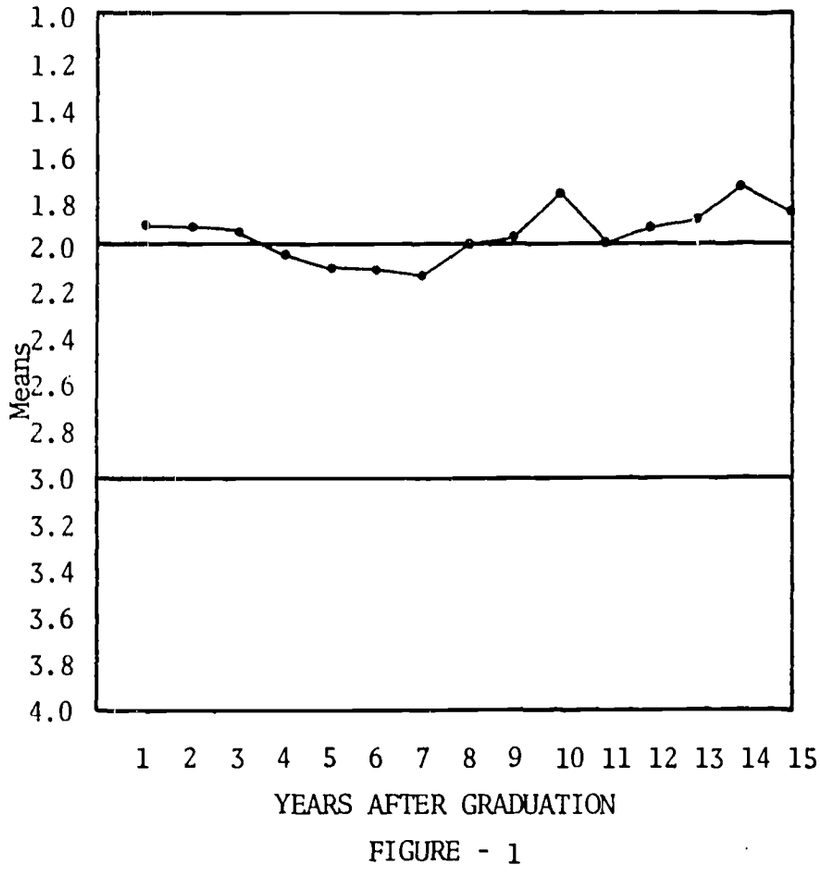
Twelve Special Topics - EET: The Quality of Instruction values assigned to the twelve special EET topics by the fifteen graduation groups are displayed in Figures 21 through 32. Tables of Means and Standard Deviations for each of the graduation groups are found in Appendix I.

Quality of Instruction for Vacuum Tubes was rated slightly higher by the older graduation groups. The values straddled the boundary between the "good to fair" and "excellent to good" categories. Transistor Circuits Quality of Instruction displayed a relatively sharp downward trend for the twelve graduation groups that received instruction in this topic. The groups that have been out of college (i.e. since receiving the associate degree) for thirteen, fourteen, and fifteen years did not have this topic in their curriculum. Most of the groups had means that were in the "good to fair" region, except the last two graduation classes placed the value of quality of instruction in the "excellent to good" category. The same type of downward trend, but not as steep, was observed for Integrated Circuits Quality of Instruction. All values fell with the "good to fair" region. This topic was not included in the curriculum of those graduates who have been out from twelve to fifteen years. No observable upward or downward trend was found for Test Equipment Quality of Instruction, with all but one of the values falling in the upper part of the "good to fair" category.

Pulse Circuits was included in the curriculum for graduates who have been out up to twelve years, therefore this topic was not rated for quality of instruction by the three eldest classes. Considerable variation from year to year was noted, but there was no discernable trend over the twelve year period. Most of the values feel within the "good to fair" region. Logic Circuits Quality of Instruction was rated only by the ten most recent classes, and a downward trend was noted. The more recent graduates rated it in the upper part of the "good to fair" category while the older ones placed it in the lower part of that region. A slight upward trend was observed for Communication Circuits Quality of Instruction, but all values fell with the "good to fair" region. Industrial Circuits Quality of Instruction was stable among the fifteen classes, and all the values were in the "good to fair" region.

Microwave Theory received quality of instruction ratings only from the past eleven classes, with no observable upward or downward trend. Most values were in the lower portion of the "good to fair" region, although several fell in the upper part of the "fair to poor" category. The ratings for Trouble Shooting Quality of Instruction were stable over the fifteen groups, with values in the "good to fair" range. A slight downward trend in the values of Binary Arithmetic Quality of Instruction for the eleven groups in which it was rated was observed. All but one value fell within the "good to fair" category. Boolean Algebra Quality of Instruction was rated by only nine of the graduation groups and no upward or downward trend was observed. Most of the values fell with the "good to fair" region.

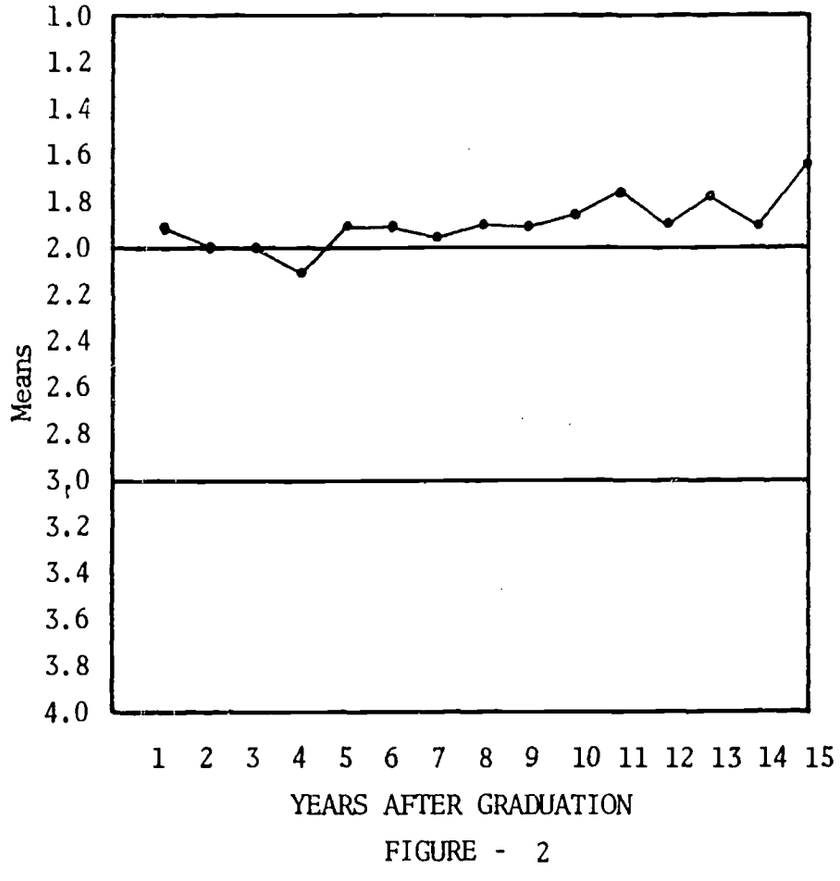
In conclusion: Slight upward trends were observed for Quality of Instruction in Vacuum Tubes and Communication Circuits. Downward trends were found for Quality of Instruction in Transistor Circuits, Integrated Circuits, Logic Circuits, and Binary Arithmetic. The remaining topics received relatively similar Quality of Instruction ratings from all of the graduation groups.



MATHEMATICS
EET
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 1.95

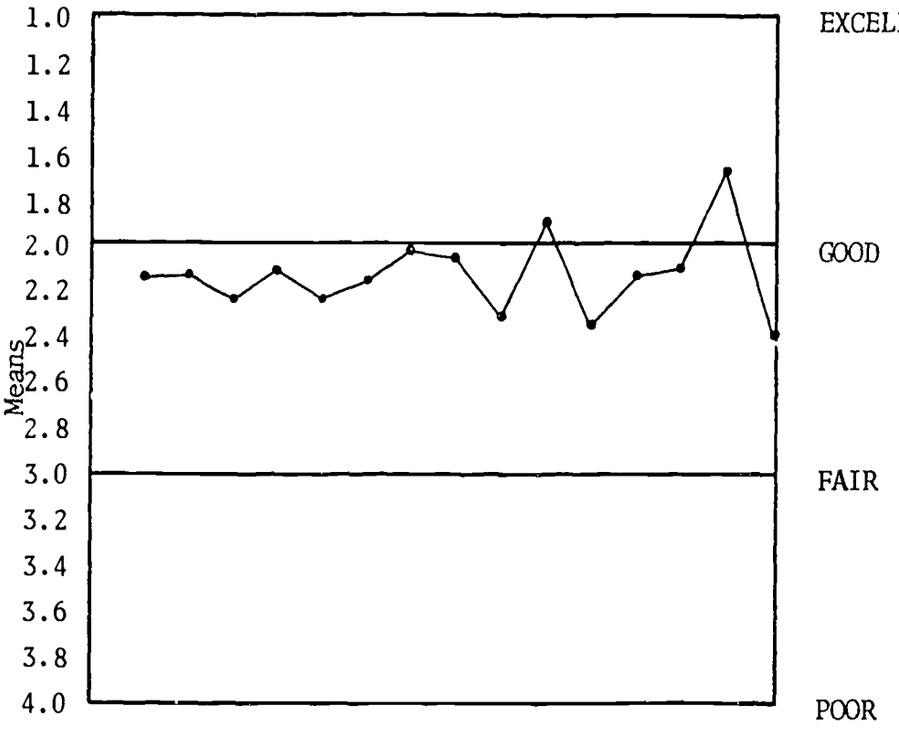
FIGURE - 1



MATHEMATICS
DDT
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 1.88

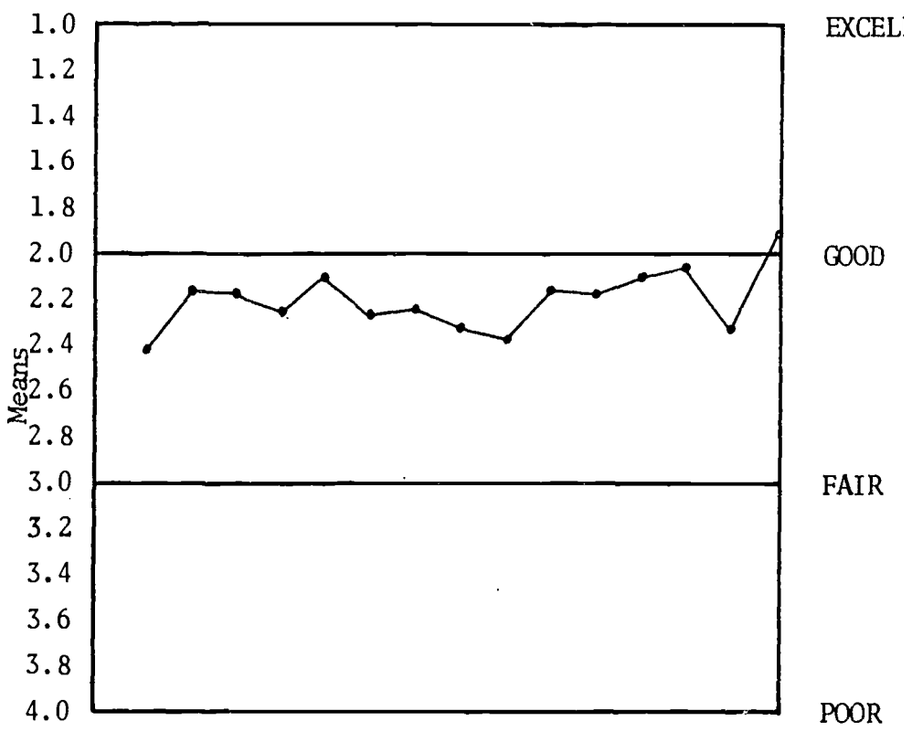
FIGURE - 2



SCIENCE
EET
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.13

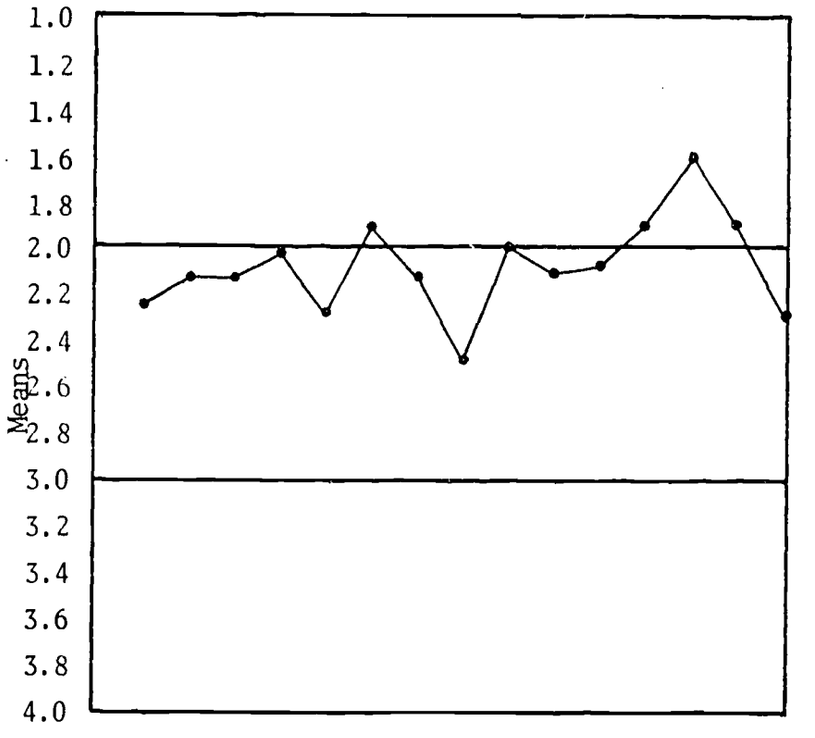
FIGURE - 3



SCIENCE
DDT
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.20

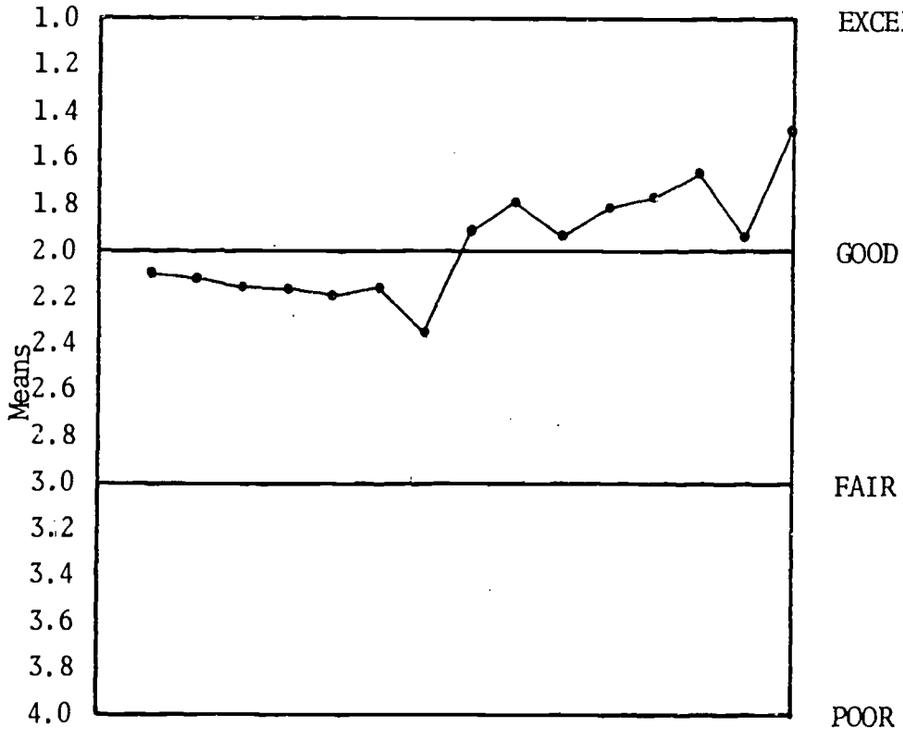
FIGURE - 4



ENGLISH
EET
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.07

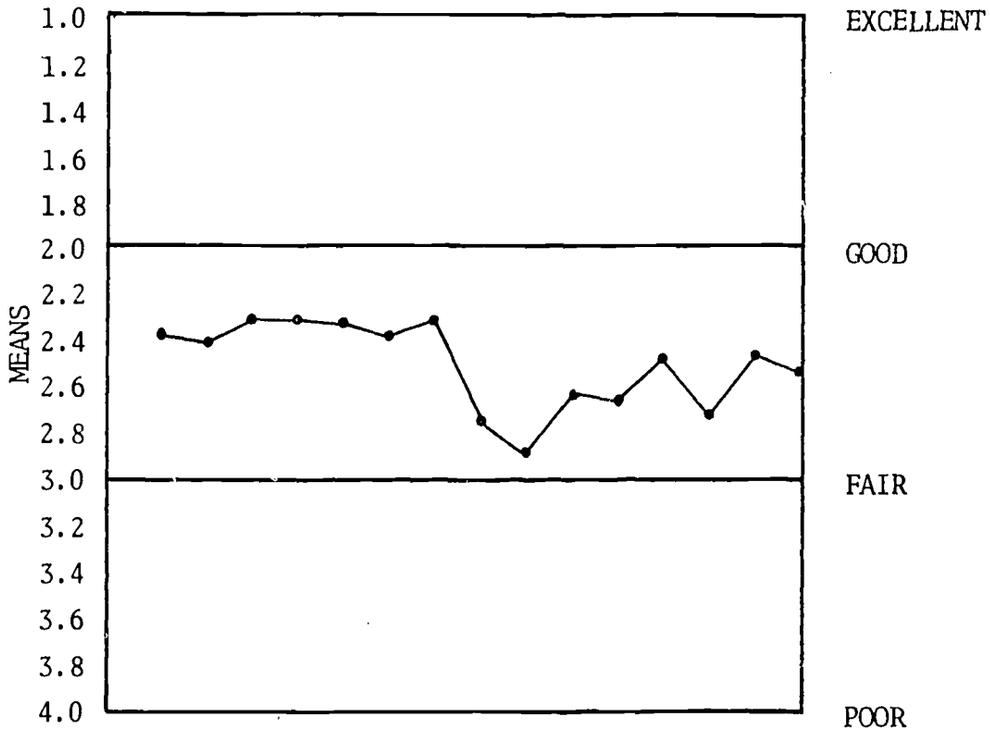
FIGURE - 5



ENGLISH
DDT
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 1.96

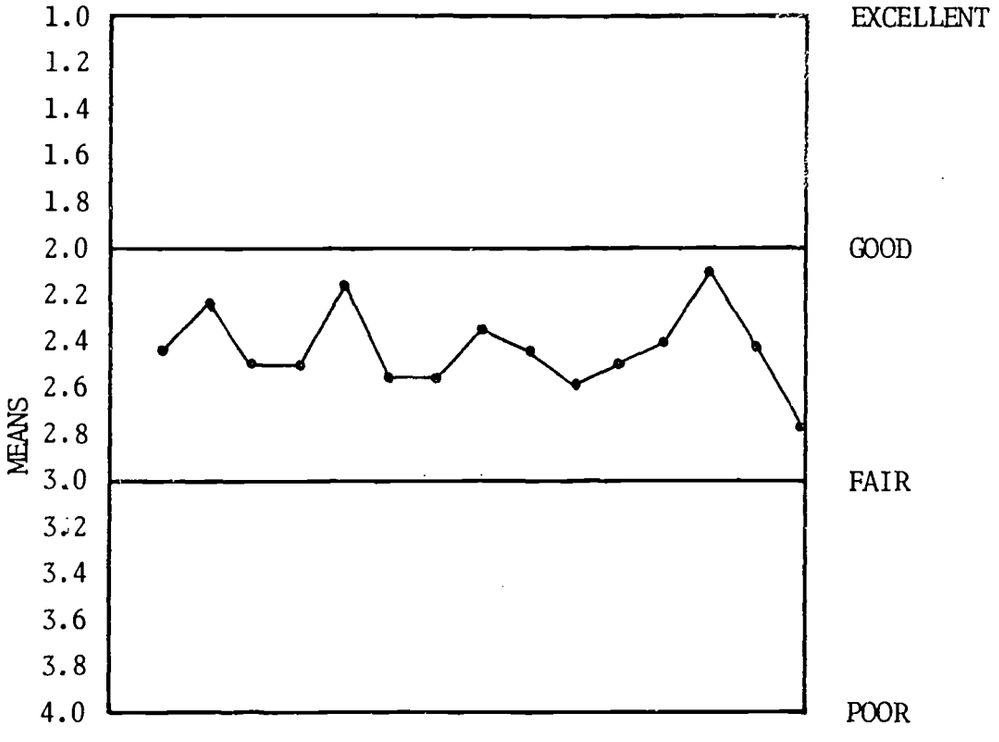
FIGURE - 6



SOCIAL SCIENCE
(EET)
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.51

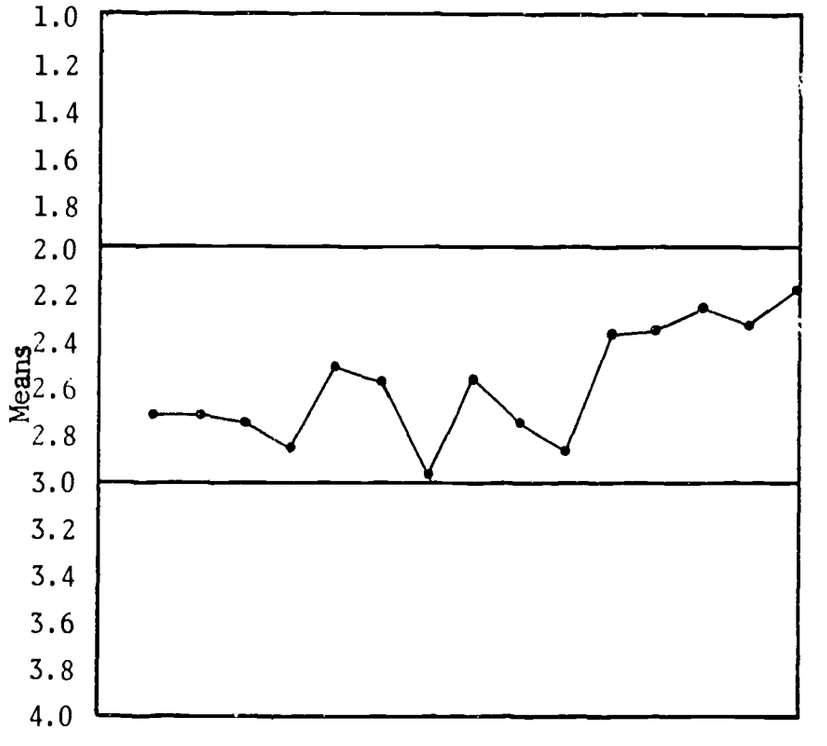
FIGURE - 7



SOCIAL SCIENCE
(DDT)
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.45

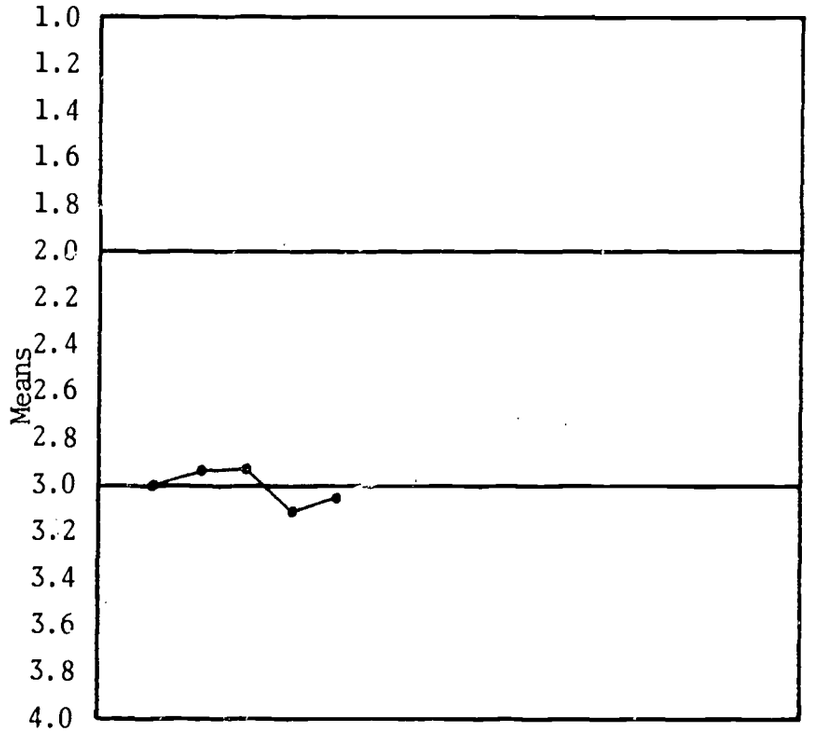
FIGURE - 8



REPORT WRITING DDT QUALITY OF INSTRUCTION

15 YEAR MEAN = 2.60

FIGURE - 9



COMPUTER PROGRAMMING DDT QUALITY OF INSTRUCTION

5 YEAR MEAN = 2.96

FIGURE - 10

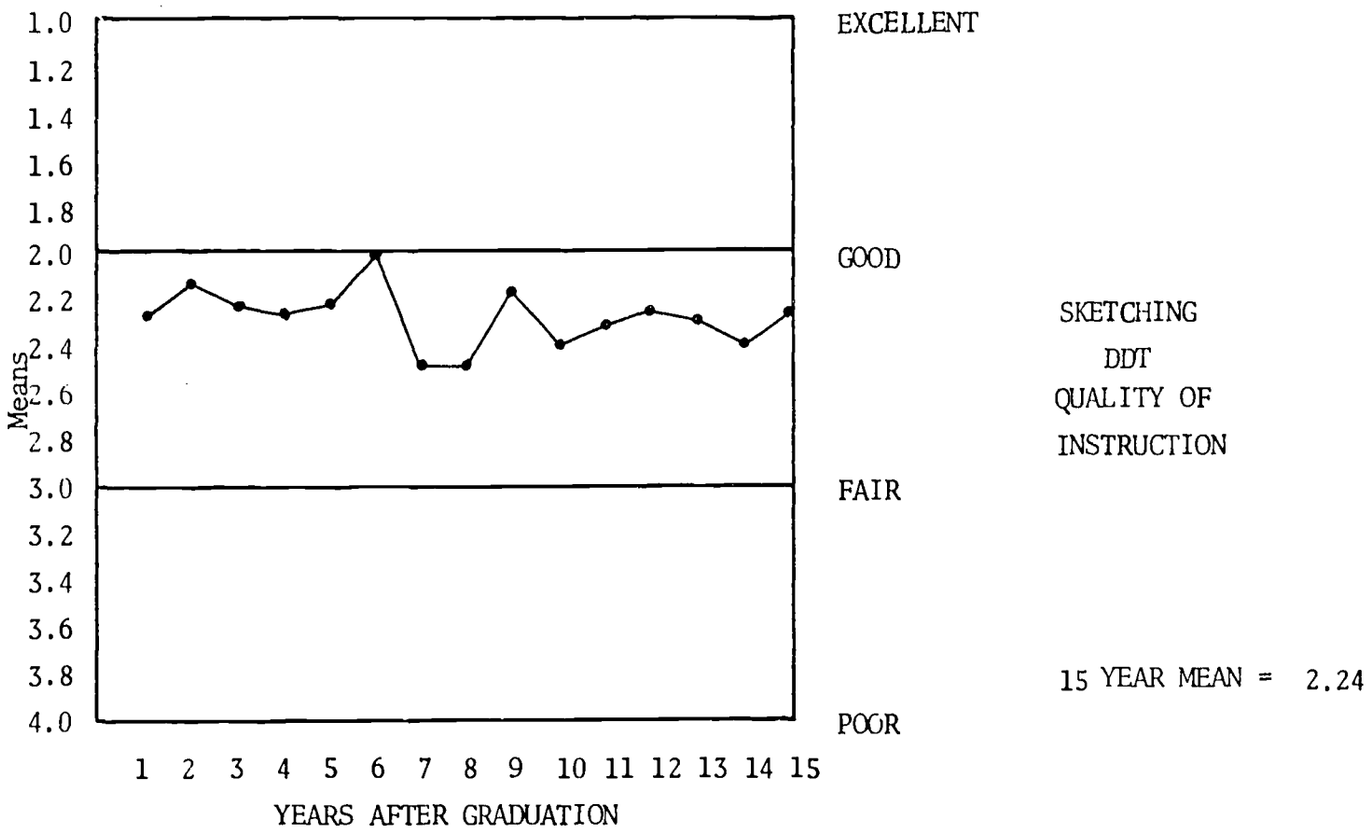


FIGURE - 11

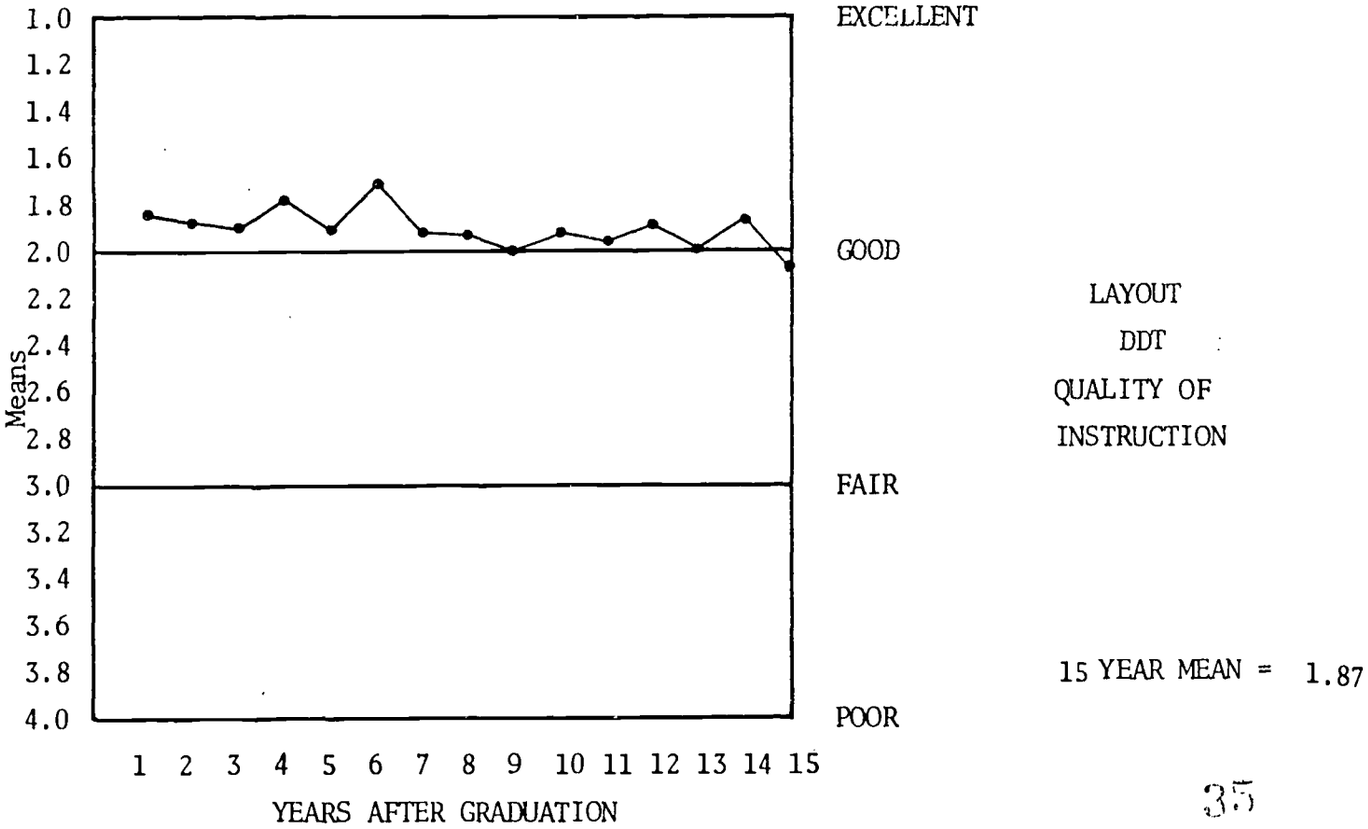
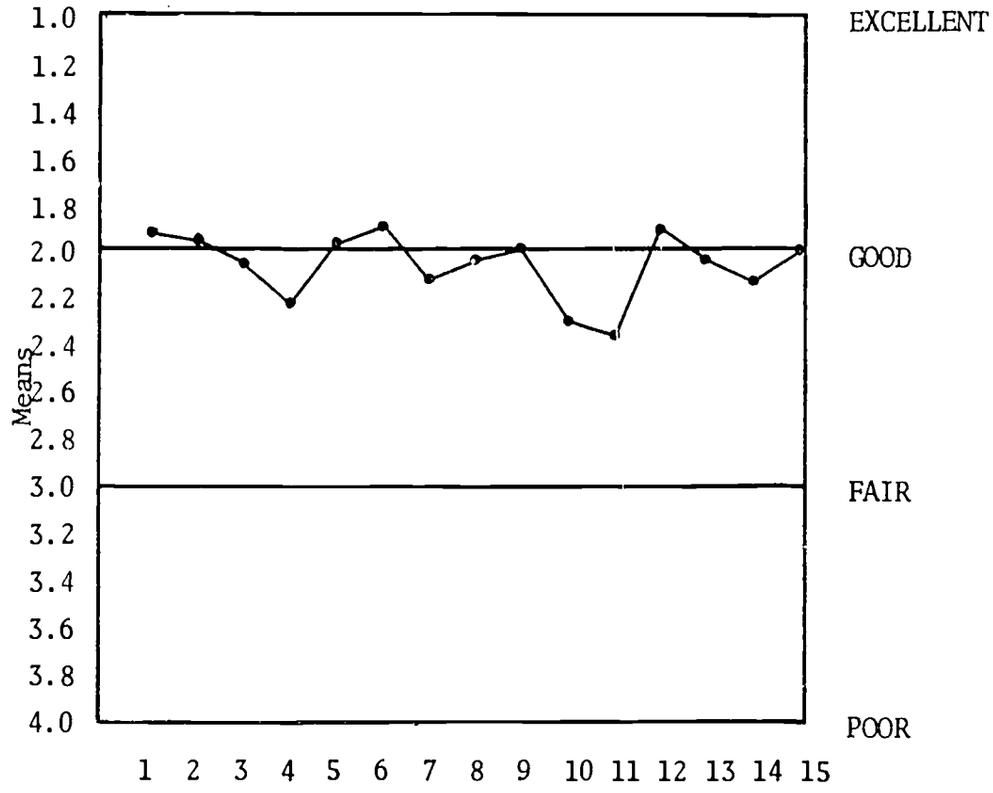


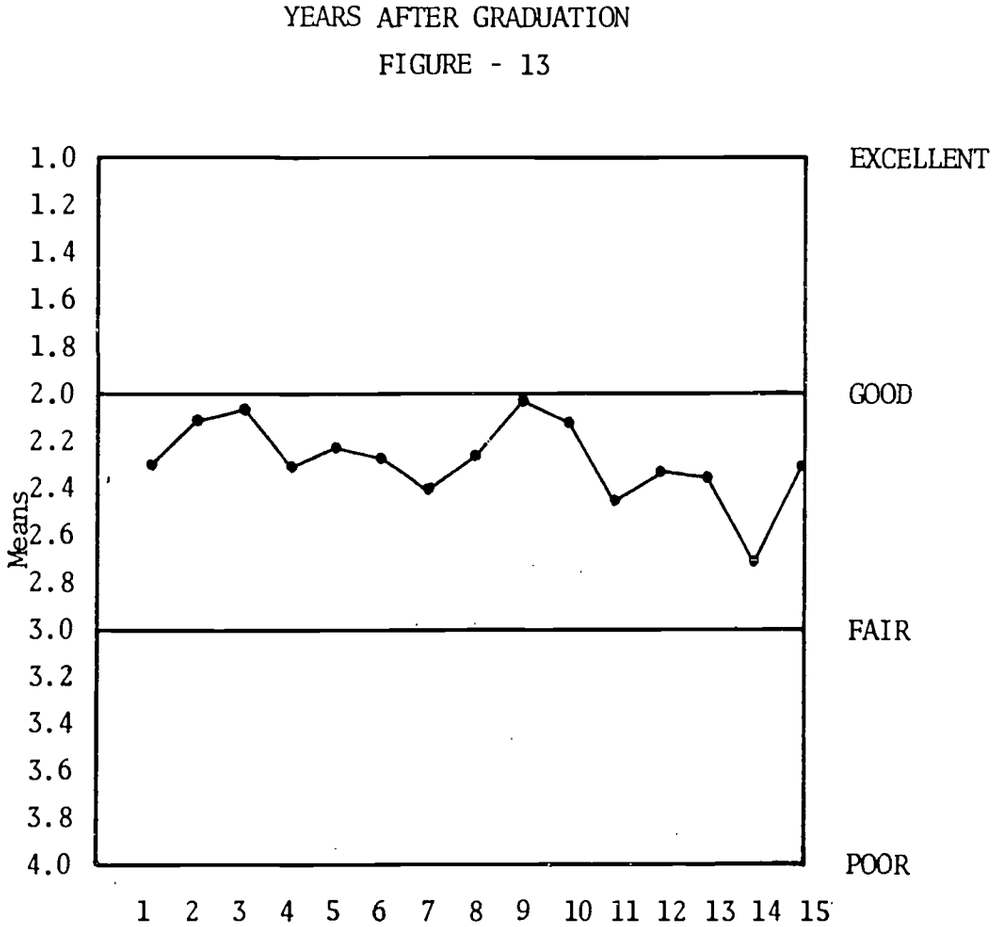
FIGURE - 12



GRAPHIC SOLUTIONS DDT QUALITY OF INSTRUCTION

15 YEAR MEAN = 2.05

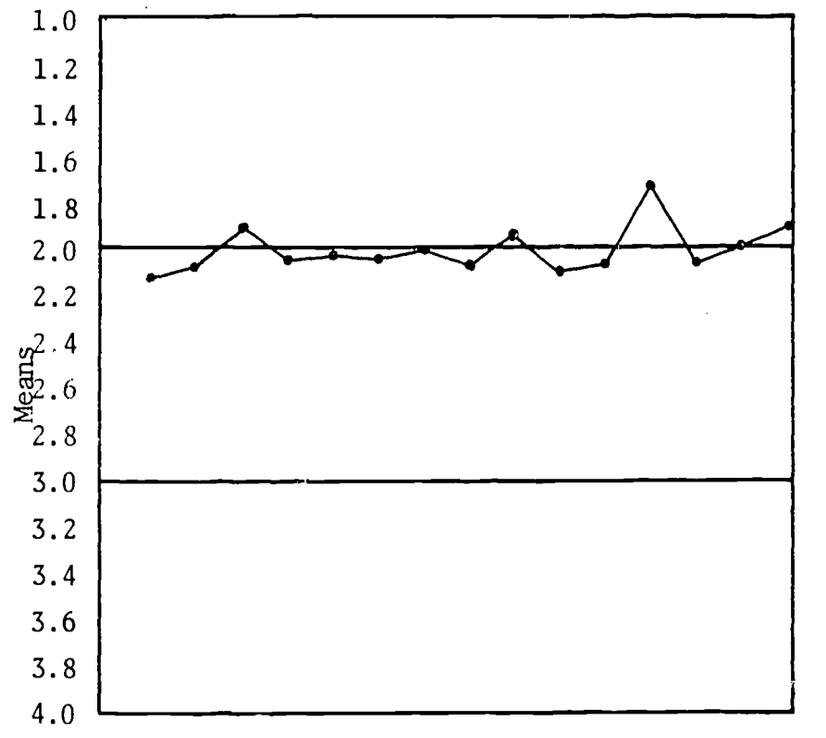
FIGURE - 13



KINEMATICS DDT QUALITY OF INSTRUCTION

15 YEAR MEAN = 2.27

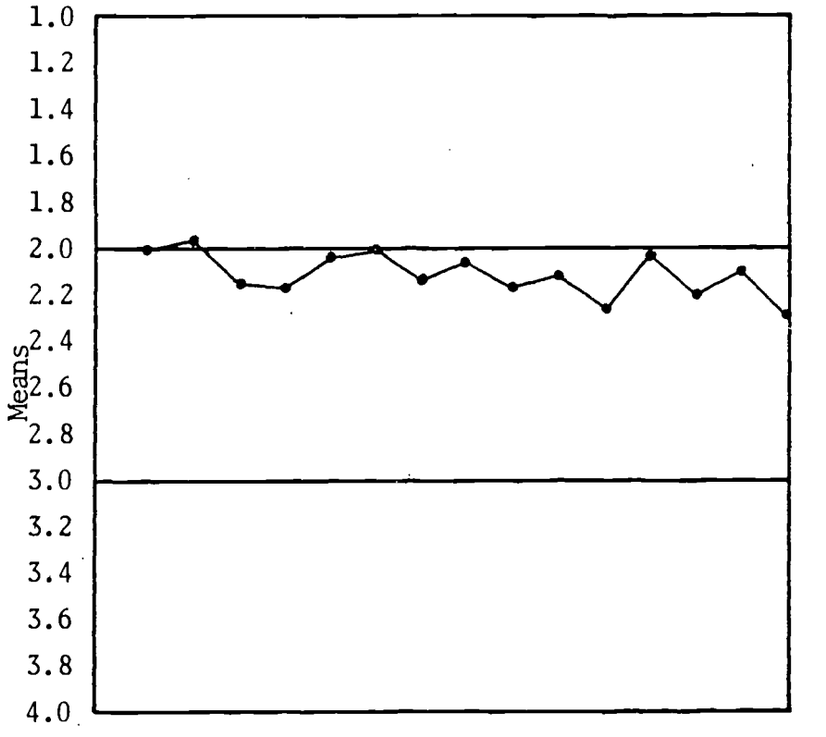
FIGURE - 14



STRENGTH OF MATERIALS
DDT
QUALITY OF INSTRUCTION

15 YEAR MEAN = 2.02

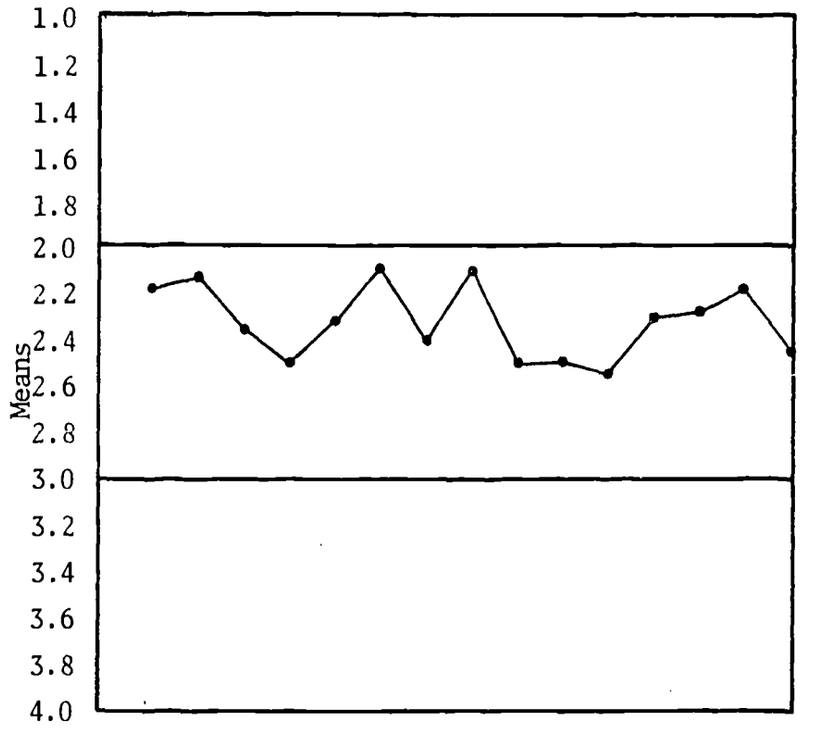
FIGURE - 15



STATIC ANALYSIS
DDT
QUALITY OF INSTRUCTION

15 YEAR MEAN = 2.10

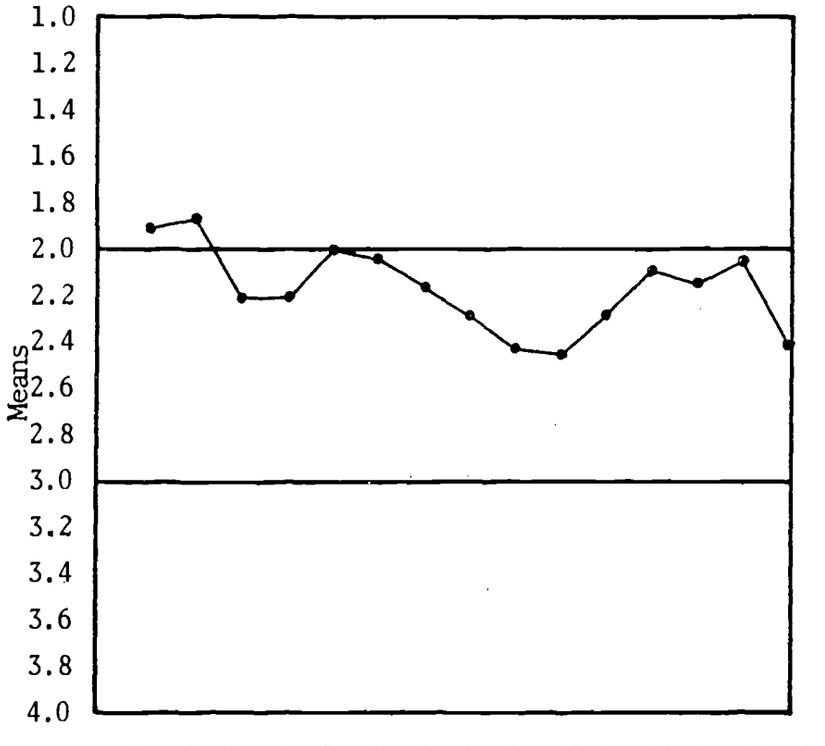
FIGURE - 16



DYNAMIC
ANALYSIS
DDT
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.32

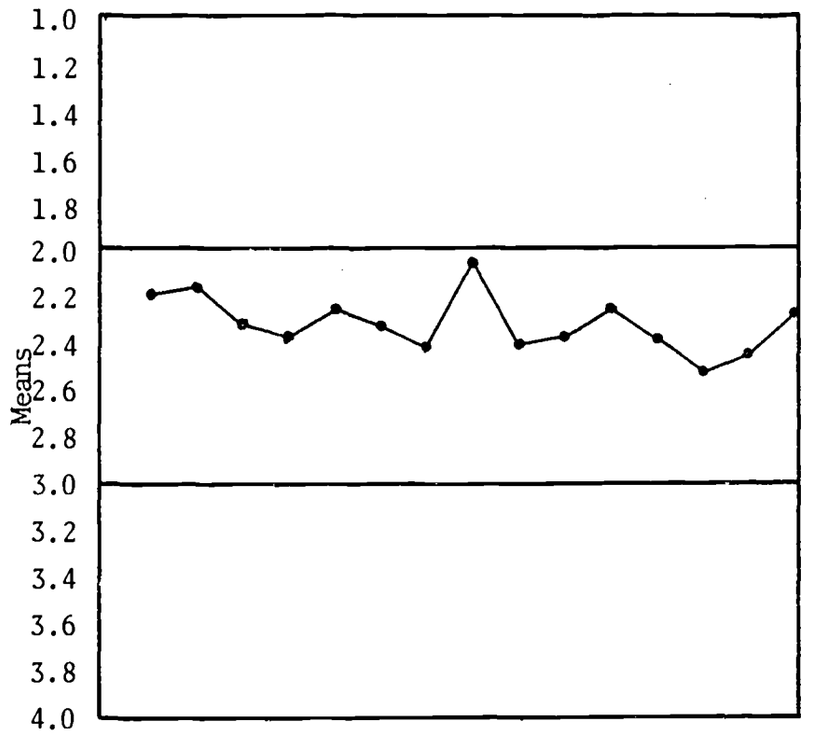
FIGURE - 17



ANALYSIS OF
STRUCTURES
DDT
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.13

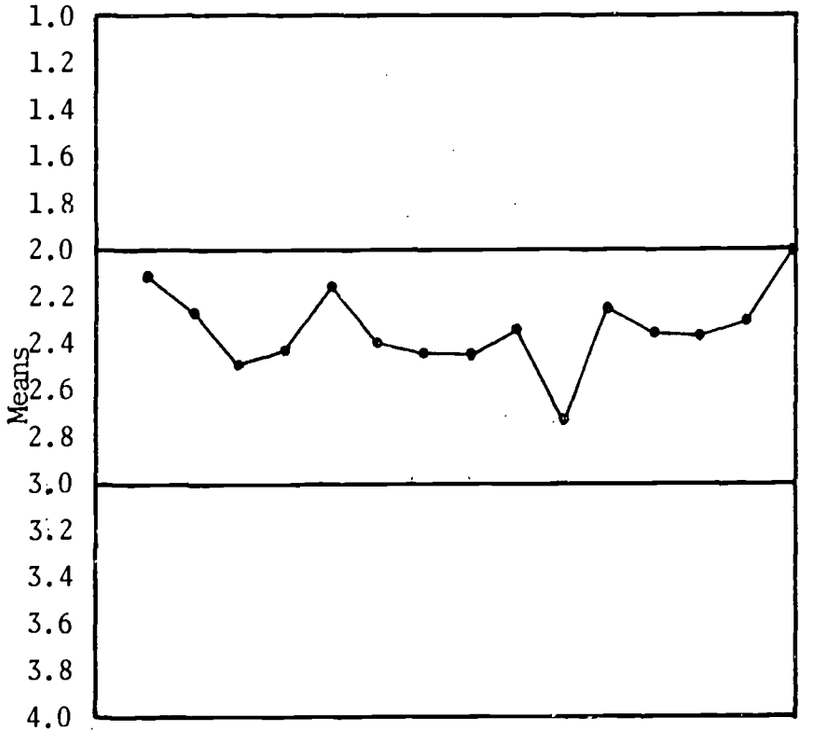
FIGURE - 18



PRODUCT DESIGN DDT QUALITY OF INSTRUCTION

15 YEAR MEAN = 2.30

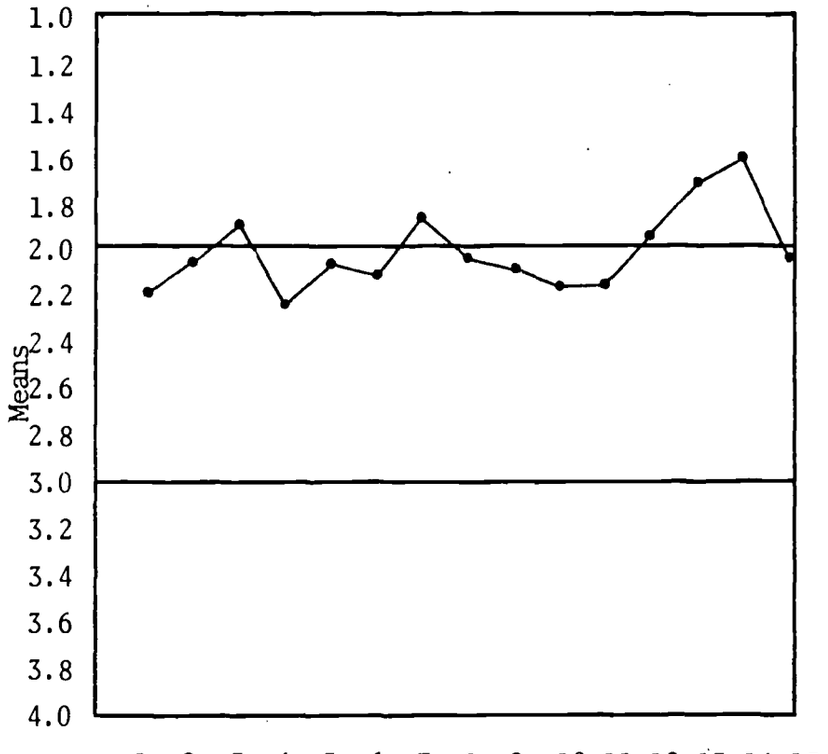
FIGURE - 19



MANUFACTURING PROCESSES DDT QUALITY OF INSTRUCTION

15 YEAR MEAN = 2.33

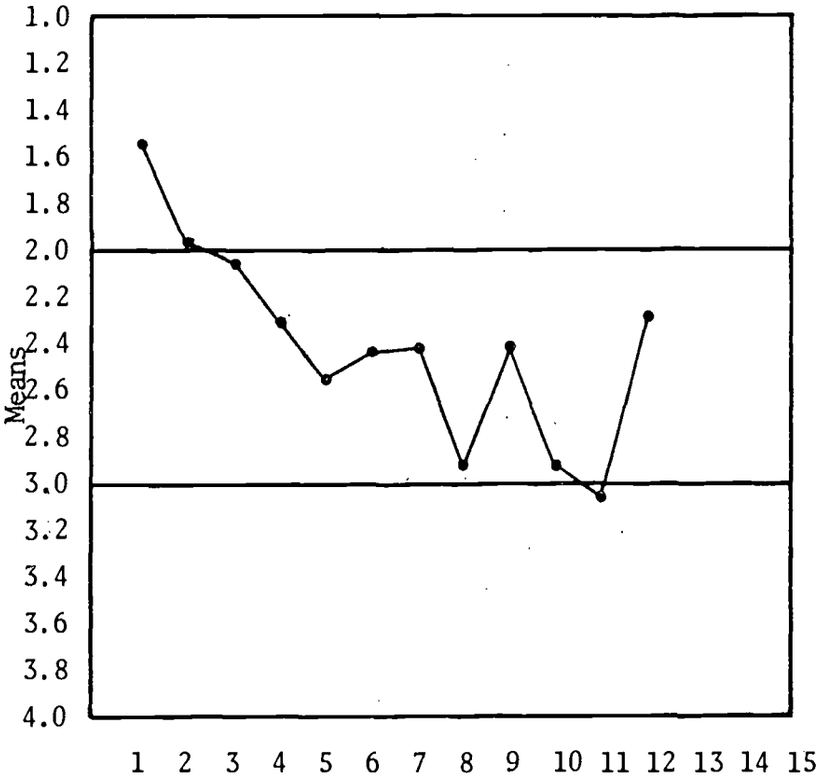
FIGURE - 20



VACUUM TUBES
EET
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.06

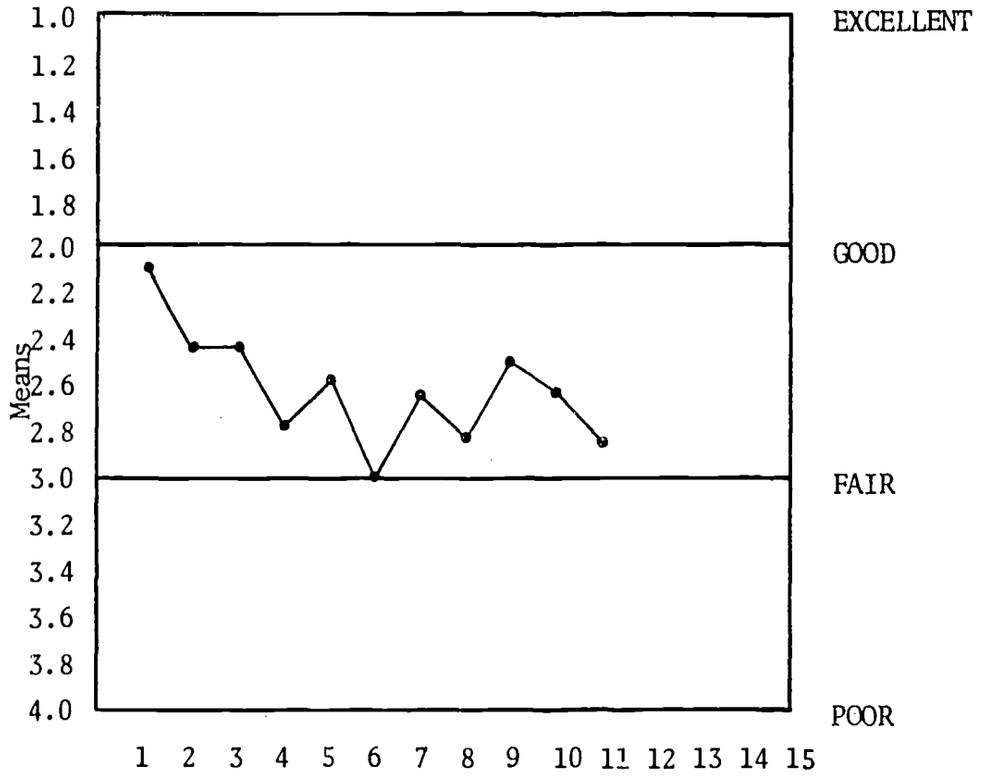
FIGURE - 21



TRANSISTOR
CIRCUITS
EET
QUALITY OF
INSTRUCTION

12 YEAR MEAN = 2.29

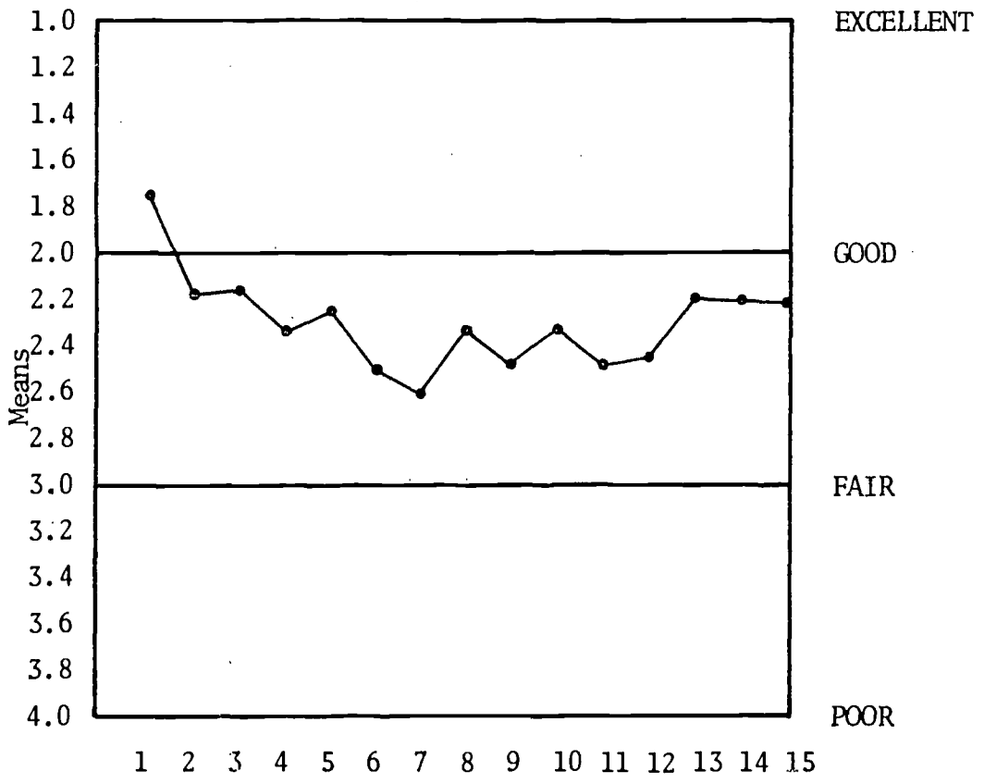
FIGURE - 22



INTEGRATED CIRCUITS EET QUALITY OF INSTRUCTION

11 YEAR MEAN = 2.47

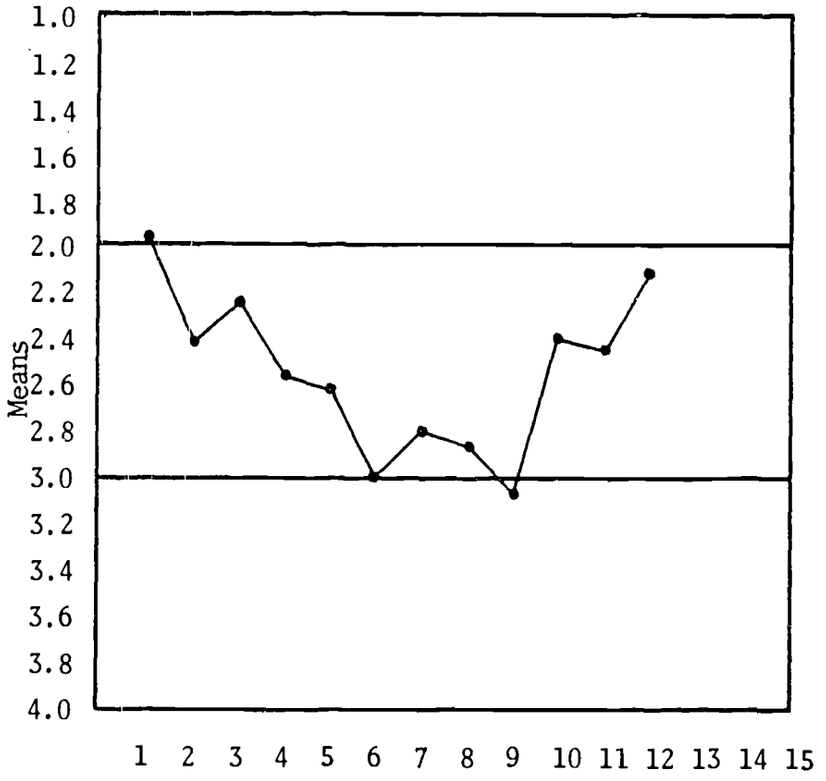
FIGURE - 23



TEST EQUIPMENT EET QUALITY OF INSTRUCTION

15 YEAR MEAN = 2.25

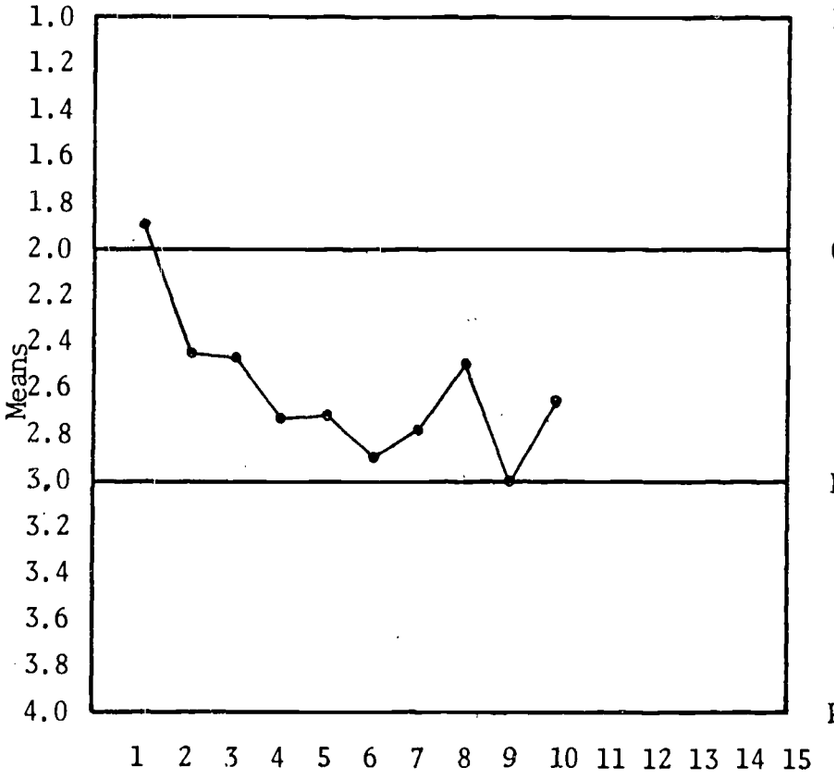
FIGURE - 24



PULSE CIRCUITS EET QUALITY OF INSTRUCTION

12 YEAR MEAN = 2.45

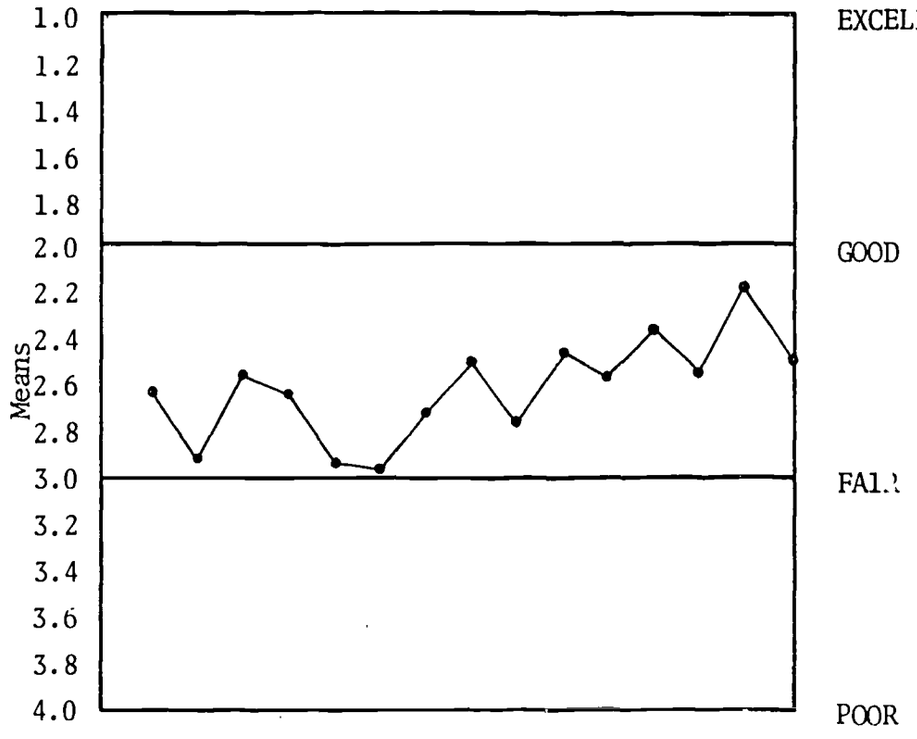
FIGURE - 25



LOGIC CIRCUITS EET QUALITY OF INSTRUCTION

10 YEAR MEAN = 2.49

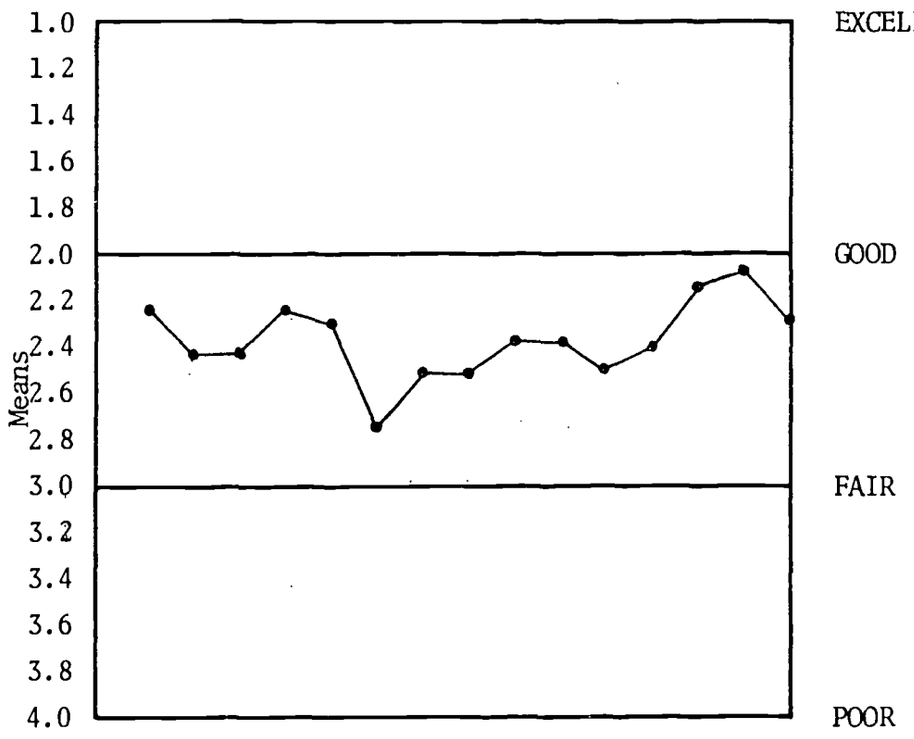
FIGURE - 26



COMMUNICATIONS
CIRCUITS
EET
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.66

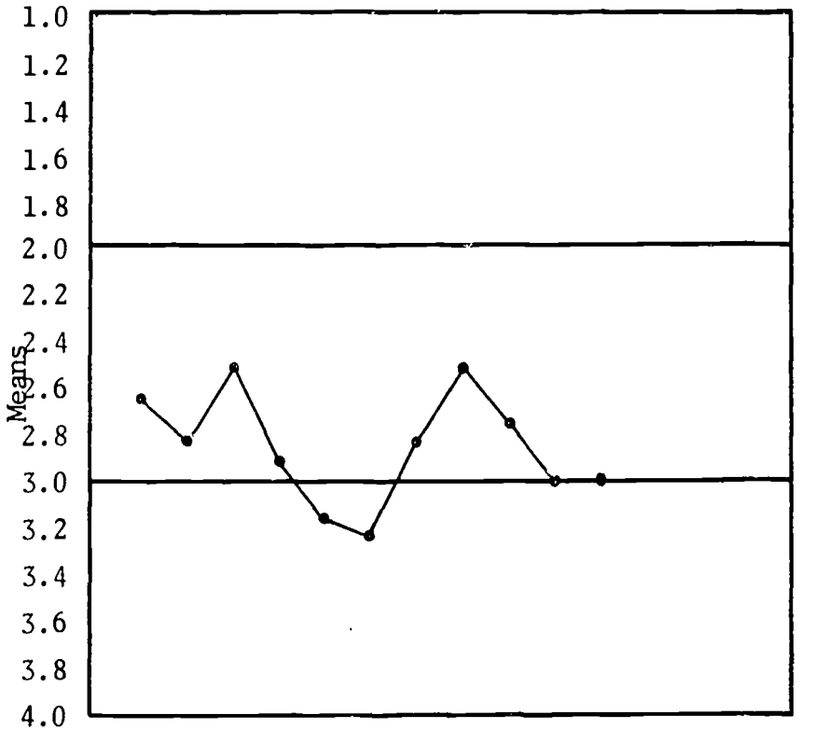
FIGURE - 27



INDUSTRIAL
CIRCUITS
EET
QUALITY OF
INSTRUCTION

15 YEAR MEAN = 2.37

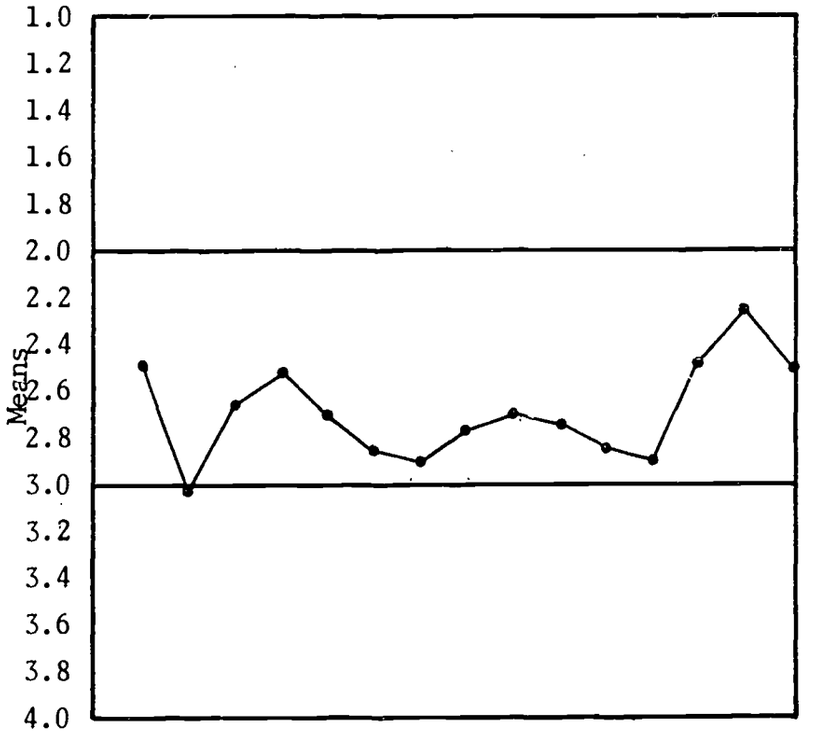
FIGURE - 28



MICROWAVE THEORY EET QUALITY OF INSTRUCTION

11 YEAR MEAN = 2.84

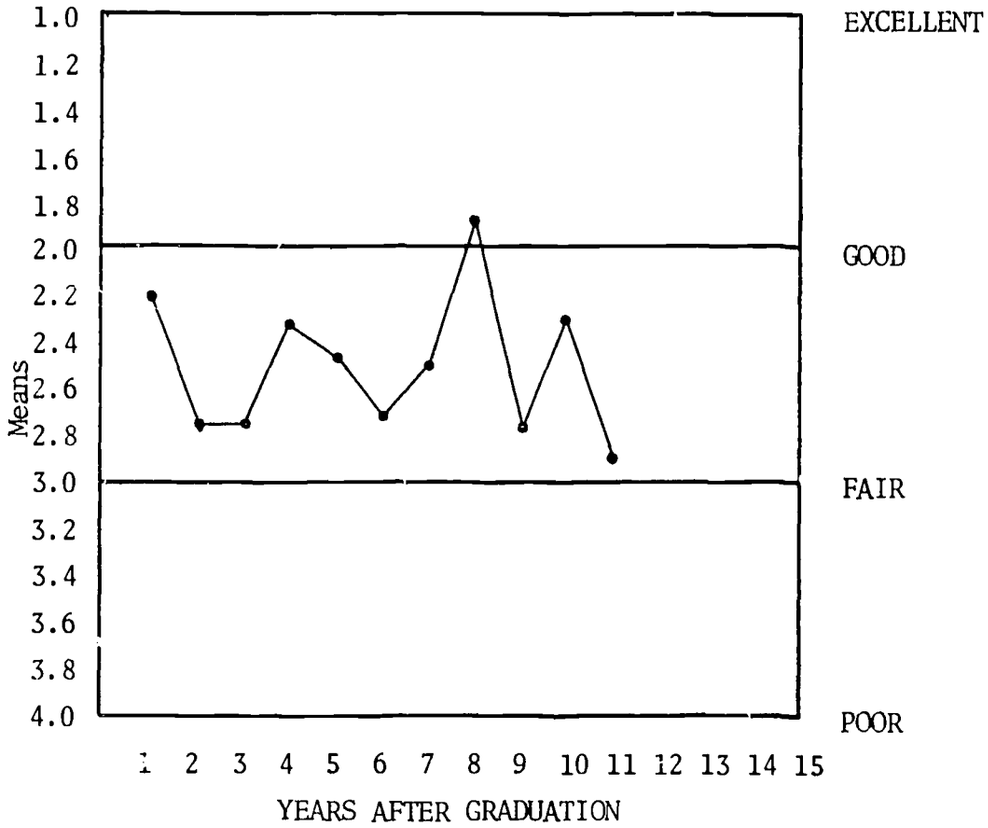
FIGURE - 29



TROUBLE SHOOTING EET QUALITY OF INSTRUCTION

15 YEAR MEAN = 2.71

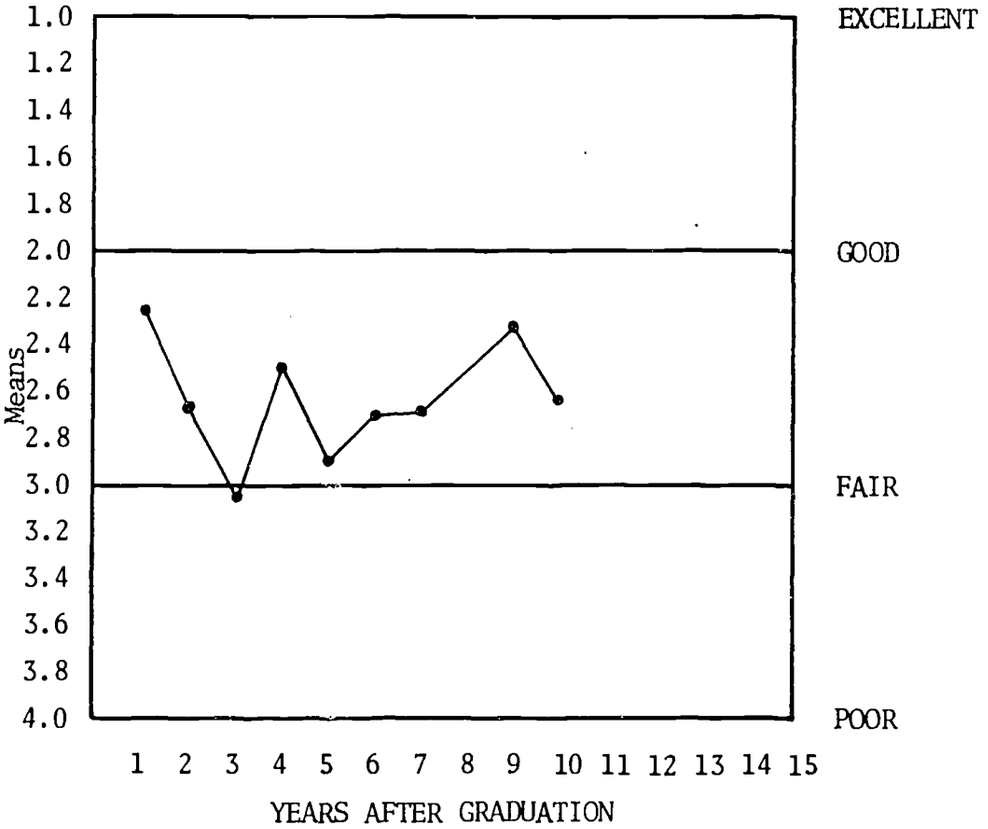
FIGURE - 30



BINARY ARITHMETIC EET QUALITY OF INSTRUCTION

11 YEAR MEAN = 2.49

FIGURE - 31



BOOLEAN ALGEBRA EET QUALITY OF INSTRUCTION

9 YEAR MEAN = 2.57

FIGURE - 32

NEED FOR COURSEWORK IMMEDIATELY AFTER GRADUATION

The respondents were asked to make judgmental responses relative to the extent to which they needed the coursework in their first post graduation job. Responses for this question were obtained for the four basic courses and the twelve special topics within each of the two curriculums (EET and DDT). The graduates were asked to judge each of the 16 items by use of the value terms of very much, much, some, and none. These in turn were converted into numerical values, from which means by graduation year were computed. The conversions were:

very much = 1

much = 2

some = 3

none = 4

The means for each graduation group by curriculum are graphically displayed in Figures 33 through 64. Tables of Means and Standard Deviations are found in Appendix II.

As mentioned in the preceding section, the graphs are plotted in such a manner that the means indicating higher ratings (which are numerically smaller) are placed highest on the y-axis. Therefore the y-axis begins with 4.0 at the origin and numerically decreases to 1.0. The y-axis is then subdivided into the three categories of very much - much; much - some; some - none, (which are the terms to which the graduates responded to in the questionnaire). The x-axis is marked off in number of years after graduation. Therefore "1" represents the graduation class of 1969 and "15" represents the graduation group of 1955.

The following paragraphs describe the findings for Need for Coursework Immediately After Graduation.

Basic Courses - DDT: The Immediate Need values assigned to the four basic courses by the graduates of the DDT curriculum by the fifteen graduation groups are displayed in Figures 34, 36, 38, and 40.

There was a slight upward trend observed in the Immediate Need values for Science, English, and Social Sciences. The Science and English ratings fell, for the most part, in the "much to some" region, while most of the values for Social Sciences Immediate Need were in the "some to none" category. Although there were considerable variations between graduation groups, the Mathematics Immediate Need values did not vary appreciably among the fifteen graduation groups. Most of the graduation classes assigned values in the lower portion of the "very much to much" region.

In conclusion: It is of interest to note that the EET and DDT groups gave the same Immediate Need values for Science, English, and Social Sciences. But the DDT group rated the Immediate Need for Mathematics higher than was the case for the ~~DDT~~ EET graduates.

Basic Courses - EET: The Immediate Need values assigned to the four basic courses by the fifteen graduation groups of the EET curriculum are displayed in Figures 33, 35, 37, and 39.

Mathematics Immediate Need was found to have a slight upward trend, with most of the values lying in the upper portion of the "much to some" category. In other words, the older graduation classes rated it more highly than the more recent groups. The same very slight upward trend was observed for Science, English, and Social Sciences. While the values for Science and English were in the "much to some" region, the Immediate Need ratings for Social Science were in the "some to none" category for most of the graduation groups.

Twelve Special Topics - DDT: The Immediate Need values assigned to the twelve special DDT topics by the fifteen graduation groups are displayed in Figures 41 through 52. The Immediate Need values remained relatively stable among the fifteen classes for the following topics: Sketching ("much to some" region); graphic solutions ("some to none" range for most groups); kinematics ("some to none" region); analysis of structures ("some to none" for most groups); Manufacturing Processes (lower portion of the "much to some" range for most groups); Report Writing ("some to none" range).

Upward trends (rated more highly by the older graduation classes) in Immediate Need values were observed for: Layout (most values in the "much to some" category); strength of materials (most values in the "much to some" range); static analysis (most values in the "some to none" range); dynamic analysis ("some to none" region of values); and product design (most values in the "much to some" region).

A slight downward trend (rated more highly by the more recent graduation groups) for computer programming Immediate Need was found, with values for all years lying in the bottom portion of the "some to none" region.

In conclusion: The older DDT graduation groups indicated greater Immediate Need for five of the twelve topics, and less Immediate Need for one of them, as compared with the more recent graduates. There was no observable difference as a function of years after graduation among the other six special topics.

Twelve Special Topics - EET: The Immediate Need values assigned to the twelve special EET topics by the fifteen graduation groups are displayed in Figures 53 to 64. A relatively sharp upward trend in Vacuum Tubes Immediate Need was observed (the older classes placed much greater Immediate Need value upon it than the most recent graduates). The values ranged from the "some to none" category for the more recent classes to the "much to some" category for the older groups. A downward trend was found for Immediate Need for Transistor Circuits. The more recent classes rated it in the "much to some" region while the older graduation groups rated it in the "some to none" and "much to some" categories. A downward trend was also found for Immediate Need of Integrated Circuits, although the values given by all groups fell within the "some to none" region. Immediate Need for Test Equipment was found to have a slight upward trend with most values in the "much to some" category. The indicated Immediate Need for both Pulse Circuits and Logic Circuits displayed a downward trend (older graduation classes assigned lower values). About two-thirds of the groups had values in the "some to none" region. Although considerable variations were found for Immediate Need for both Trouble Shooting and Microwave Theory, no overall trend was observable. Values for Trouble shooting were in the "much to some" category while "some to none" values were observed for Immediate Need for Microwave Theory.

No overall trend in the Immediate Need for Communication Circuits was apparent, with most values falling with the "some to none" category. Considerable year-to-year variation was found in the Immediate Need for Industrial Circuits, and a slight upward trend was observed. The values ranged from the upper portion of the "some to none" region to into the "much to some" category. Immediate Need for Binary Arithmetic also displayed considerable variation on a year-by-year basis, with a slight downward trend. Most of the values fell within the "some to none" range. Similarly, wide variations were found for Immediate Need for Boolean Algebra, with no overall trend observed. Most values were in the "some to none" category.

In conclusion: An upward trend (valued higher by the older graduates) was found in the Immediate Need for Vacuum tubes, Test Equipment, and Industrial Circuits. A downward trend (valued higher by the more recent graduates) in the Immediate Need was found for Transistor Circuits, Integrated Circuits, Pulse Circuits, Logic Circuits, and Binary Arithmetic. The remaining four of the twelve specialized topics displayed no significant upward or downward trend by the fifteen groups as a function of years after graduation.

FIGURE - 22

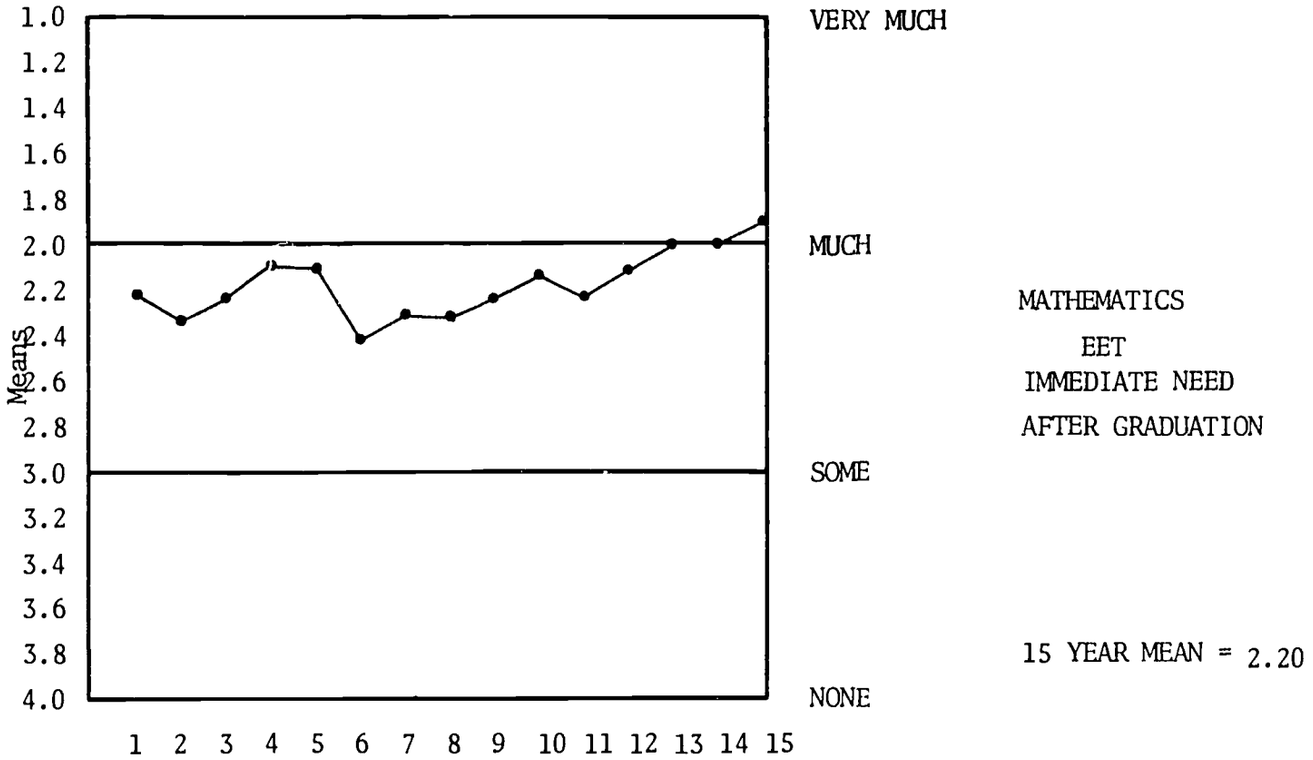


FIGURE - 33

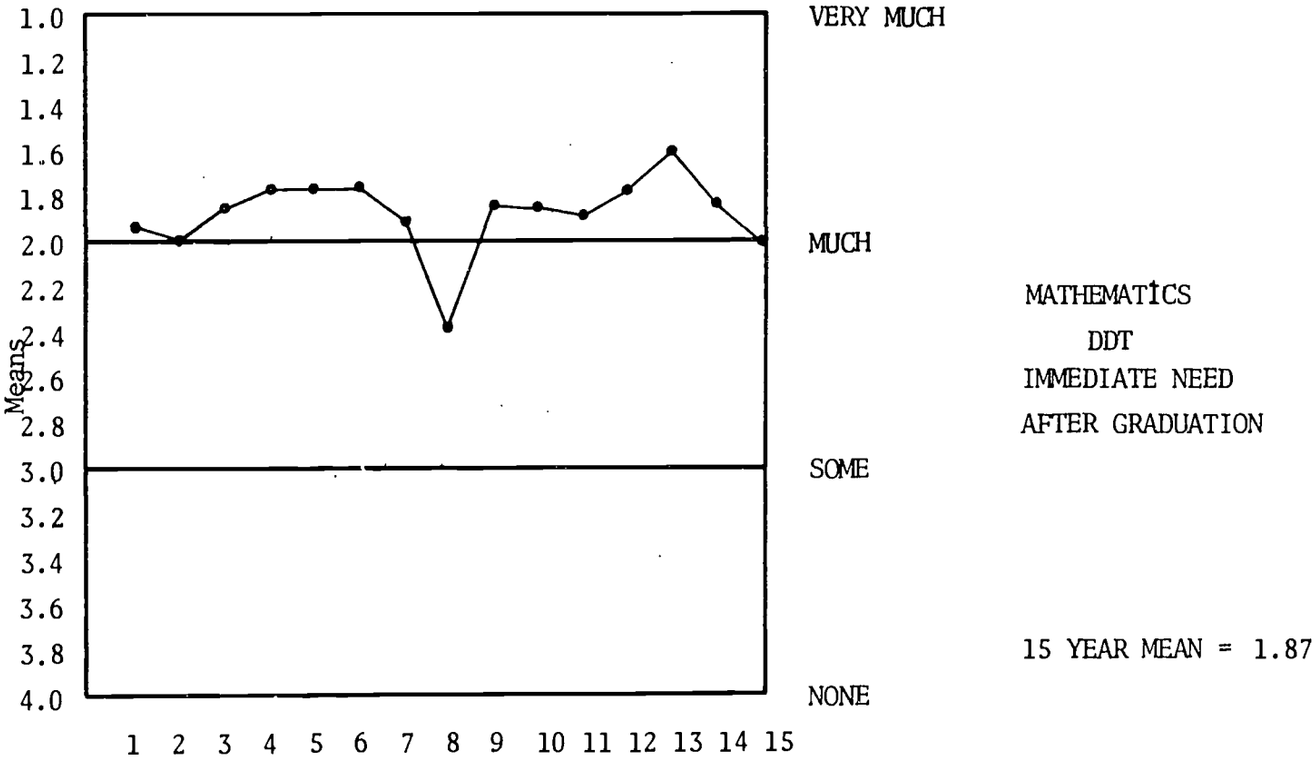


FIGURE - 34

FIGURE - 24

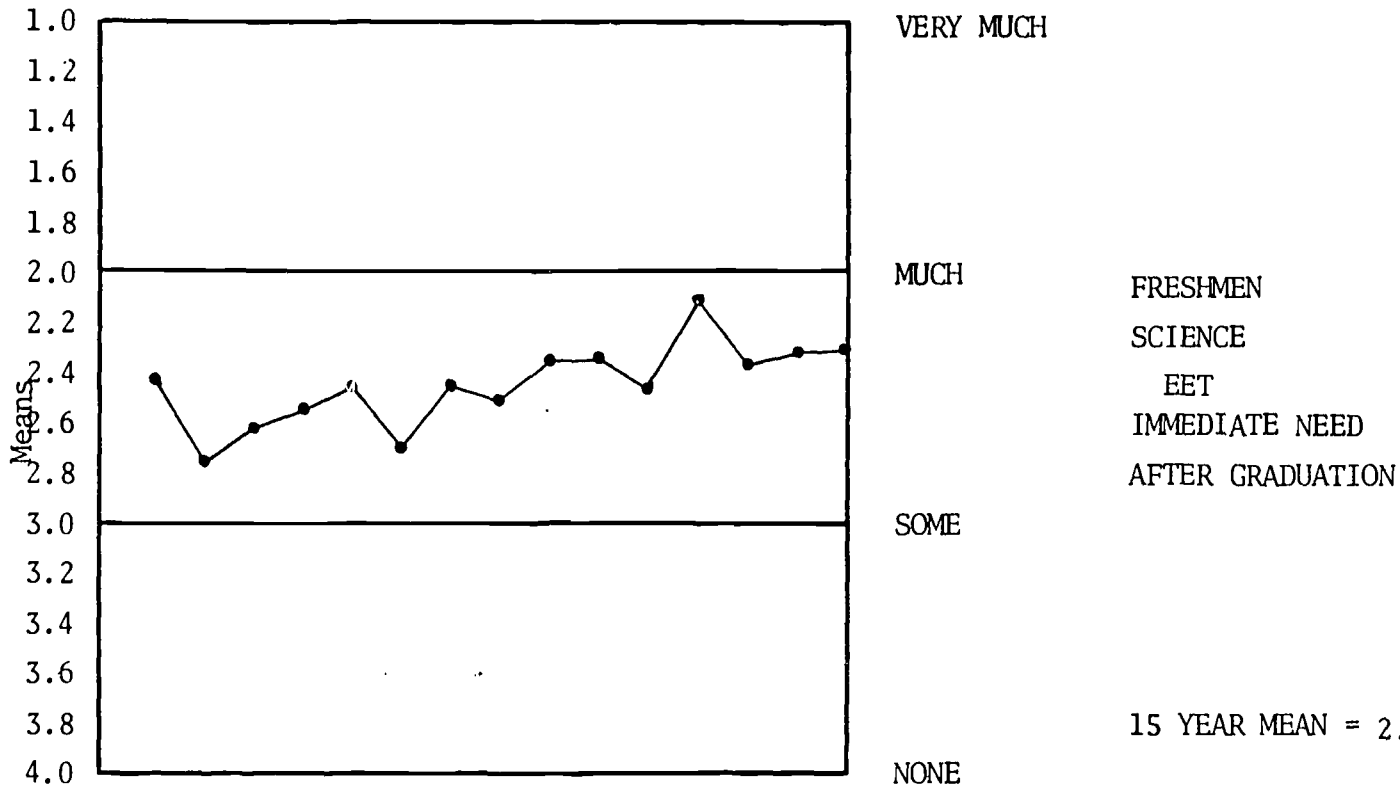


FIGURE - 35

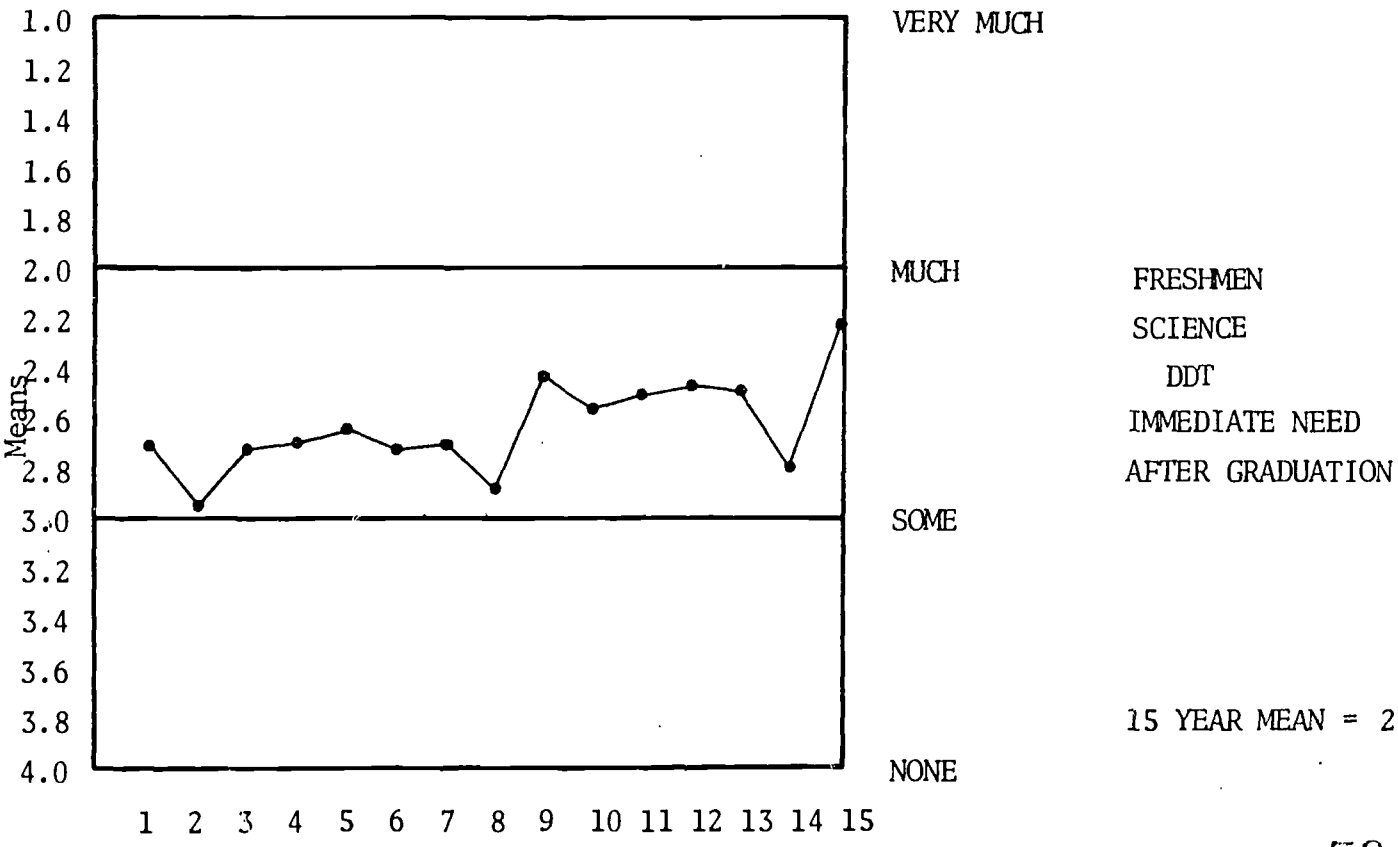


FIGURE - 36

FIGURE - 26

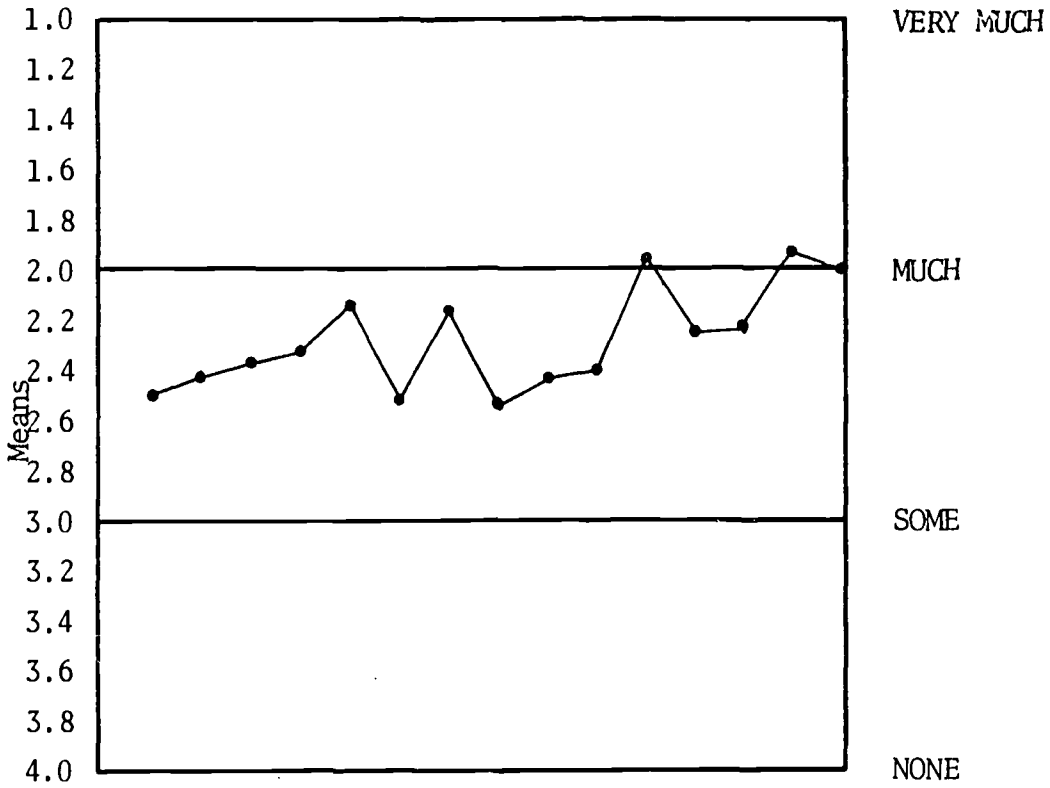


FIGURE - 37

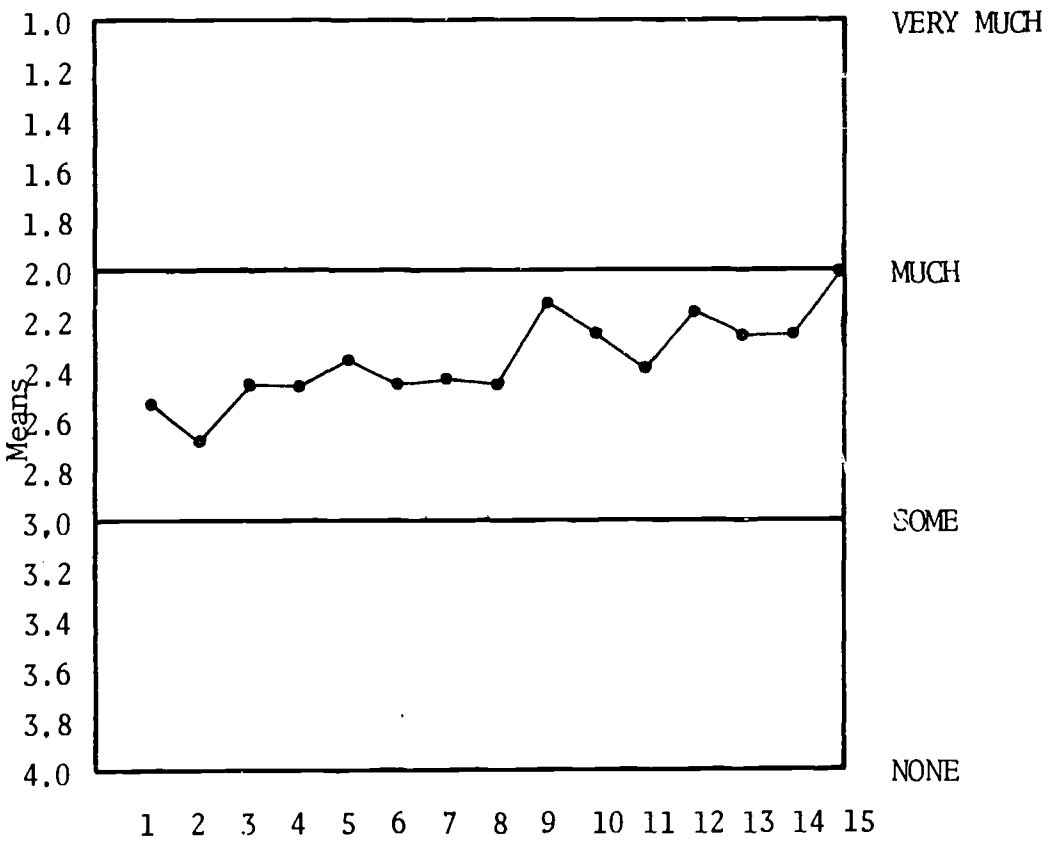
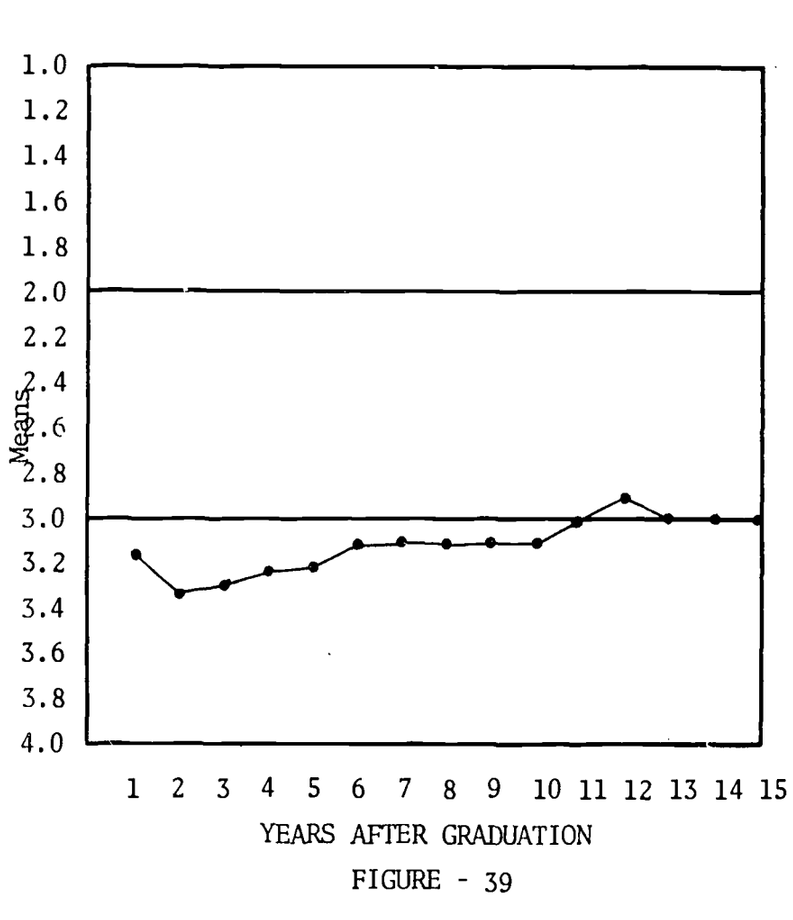


FIGURE - 38

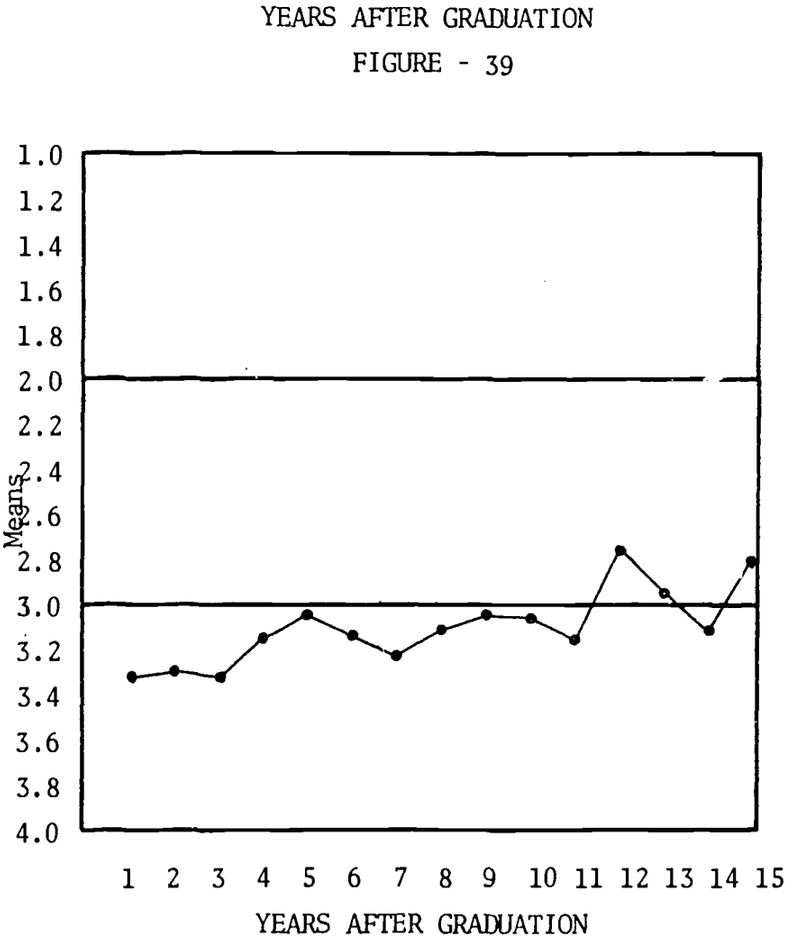
FIGURE - 28



SOCIAL SCIENCE
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.16

FIGURE - 39

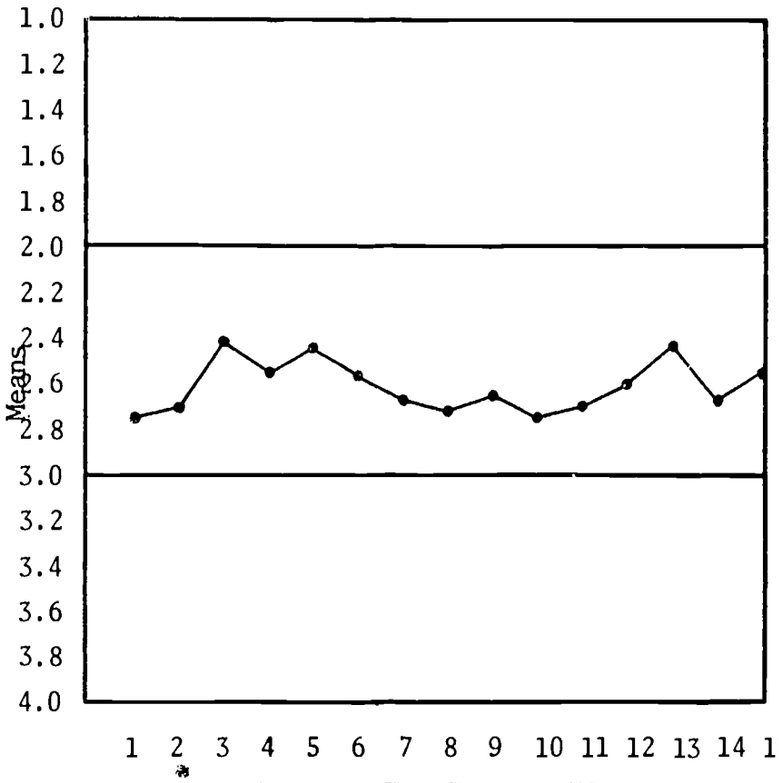


SOCIAL SCIENCE
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.16

FIGURE - 40

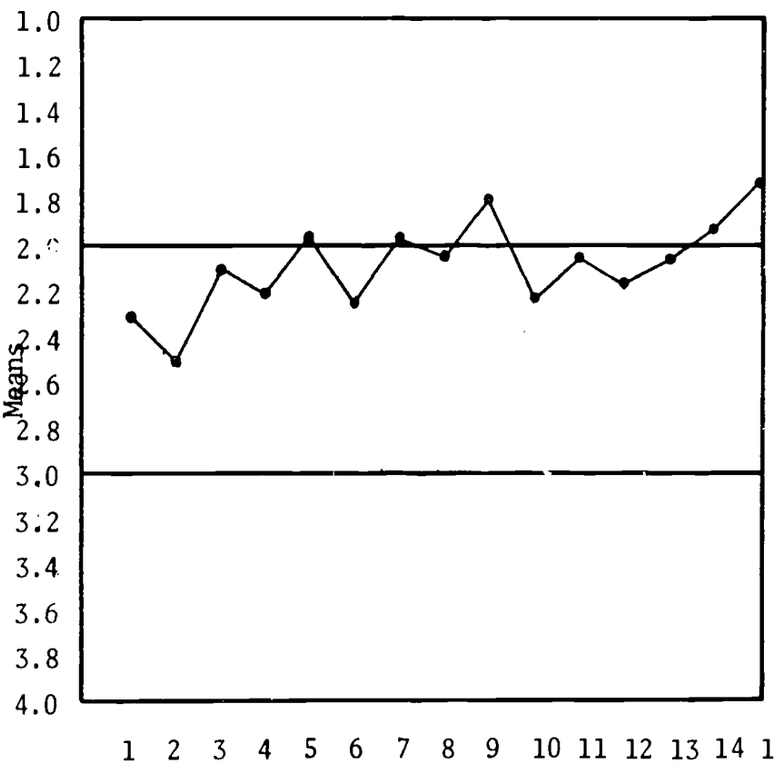
FIGURE - 30



SKETCHING
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 2.61

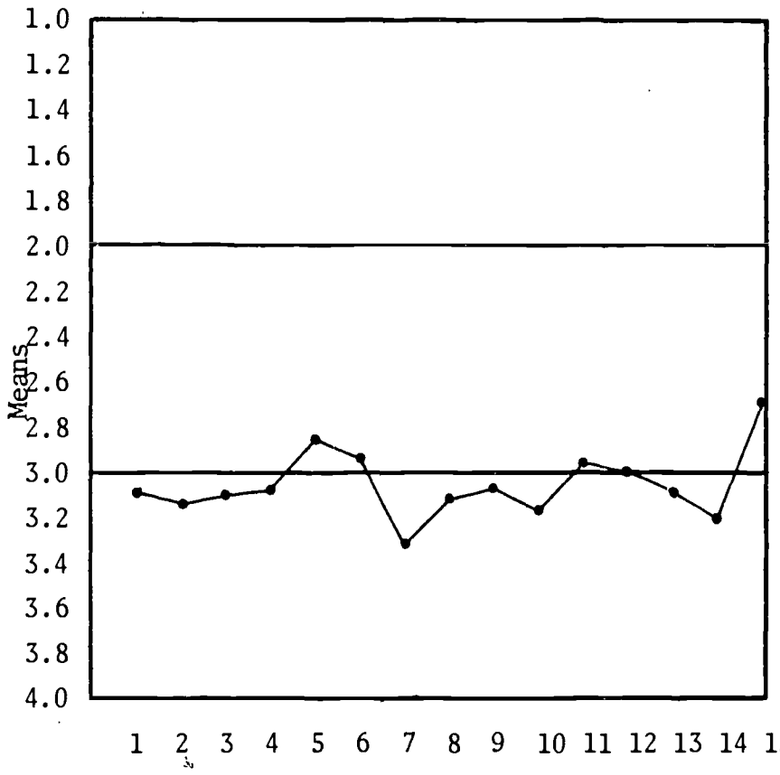
FIGURE - 41



LAYOUT
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 2.13

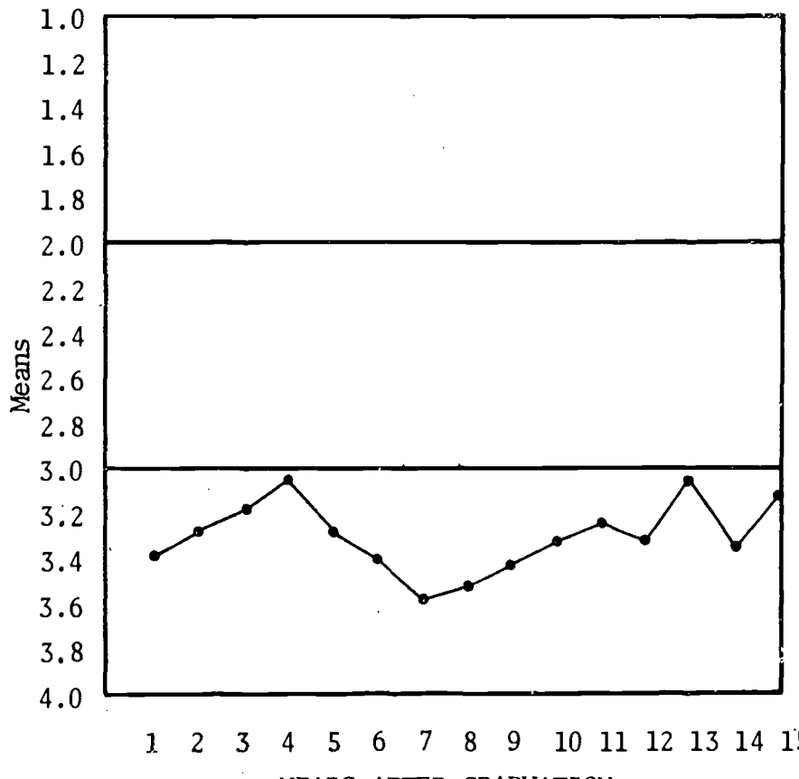
FIGURE - 42



GRAPHIC SOLUTIONS
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.08

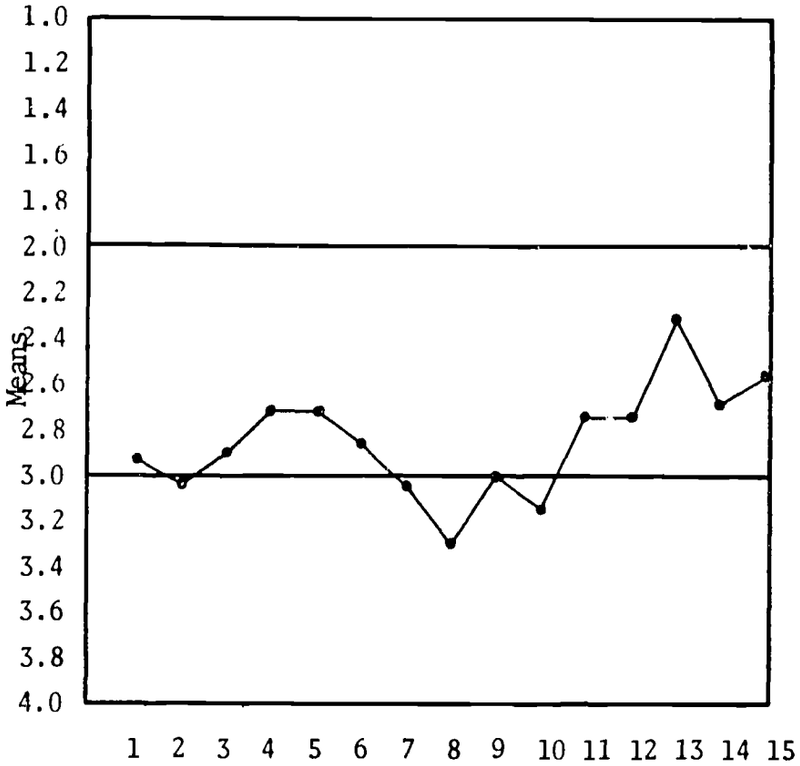
FIGURE - 43



KINEMATICS
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.32

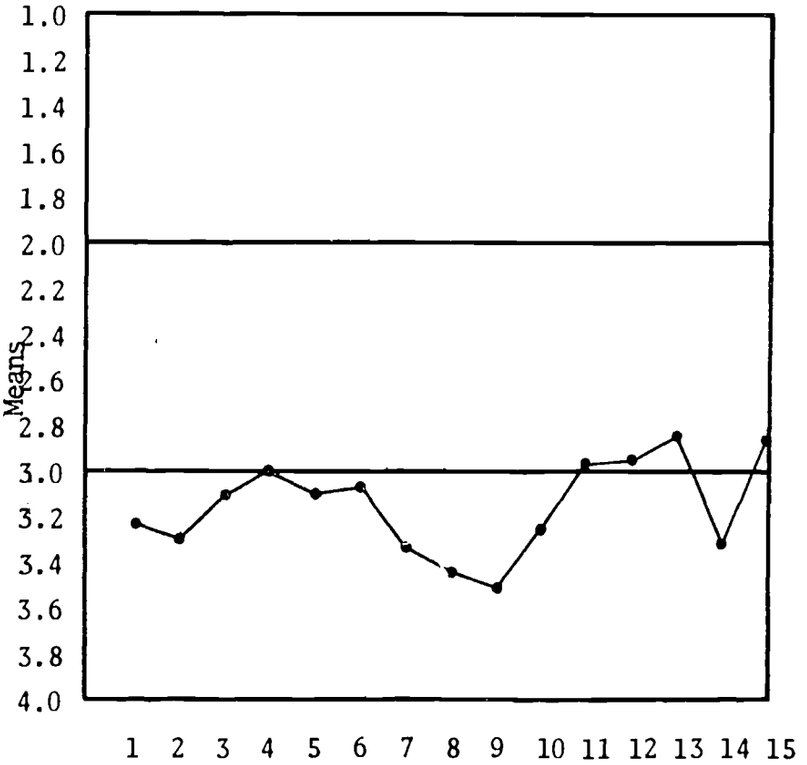
FIGURE - 44



STRENGTH OF MATERIALS
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 2.86

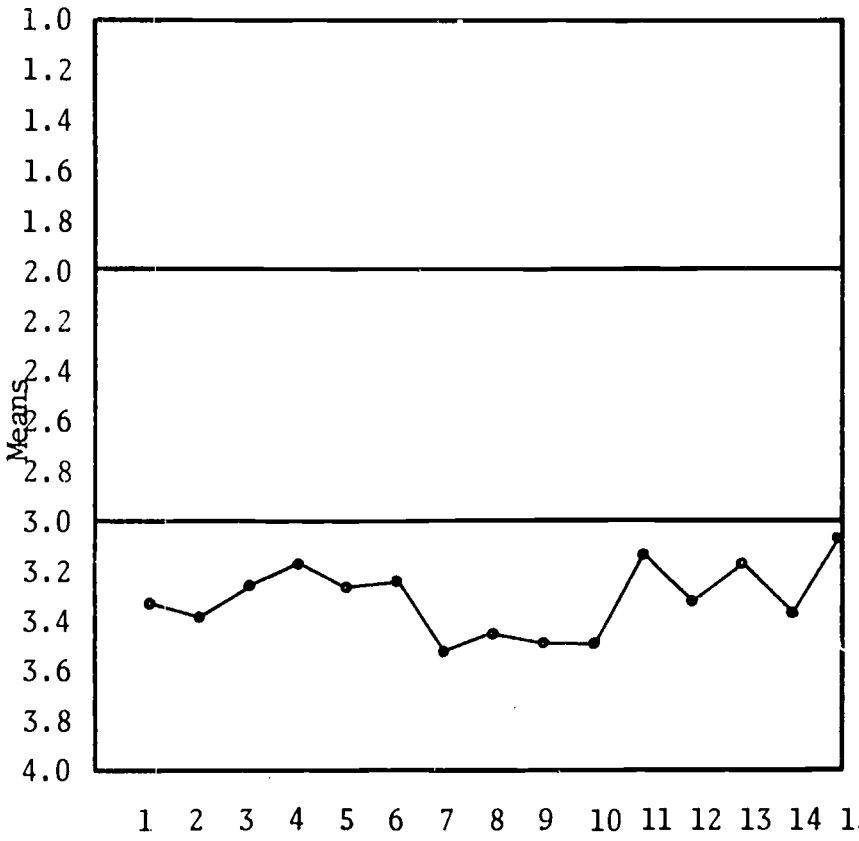
FIGURE - 45



STATIC ANALYSIS
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.17

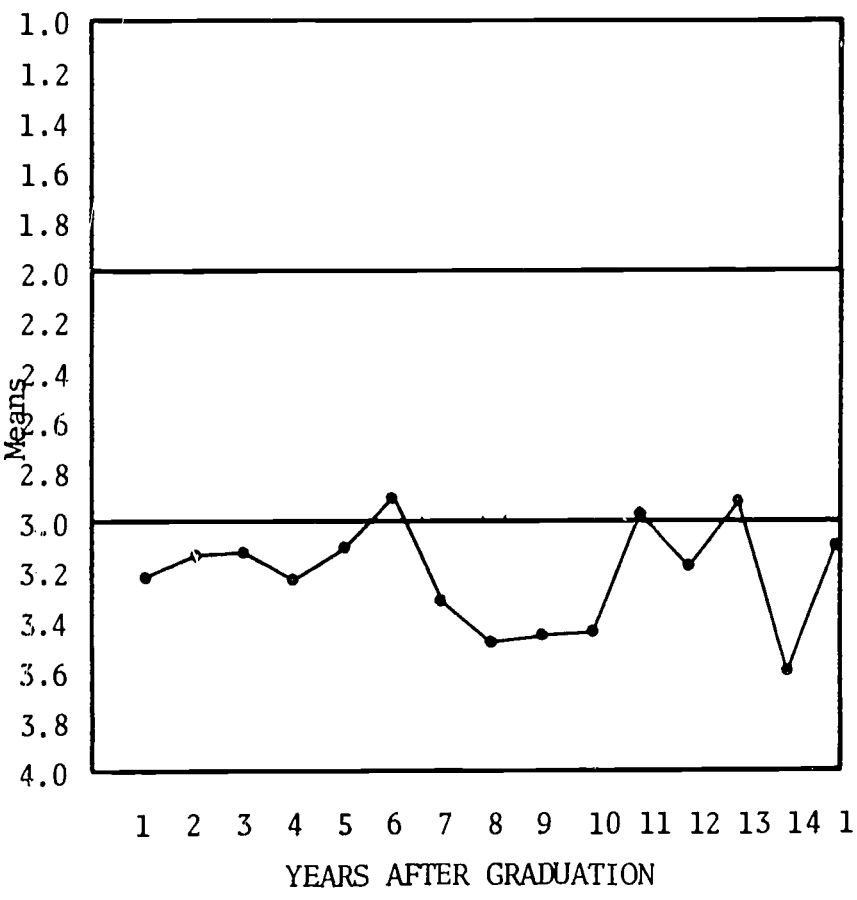
FIGURE - 46



DYNAMIC ANALYSIS
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.32

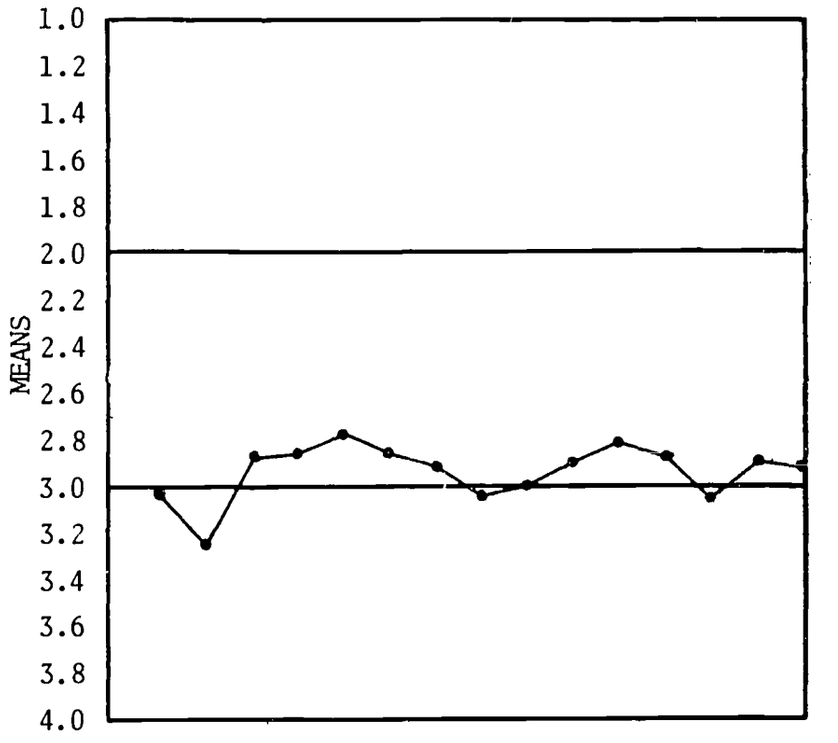
FIGURE - 47



ANALYSIS OF
STRUCTURE
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.19

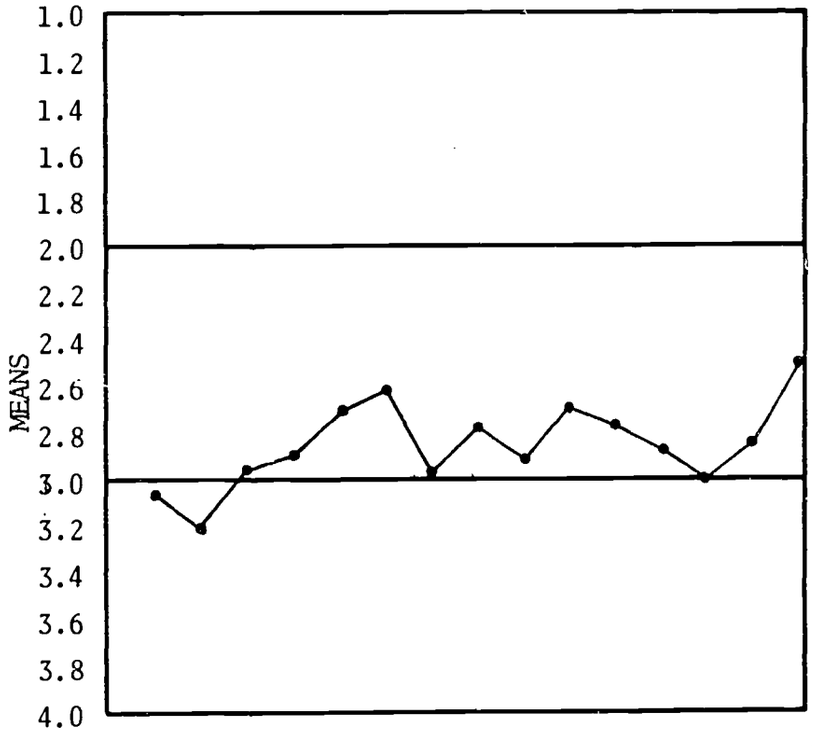
FIGURE - 48



MANUFACTURING PROCESS
(DDT)
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 2.93

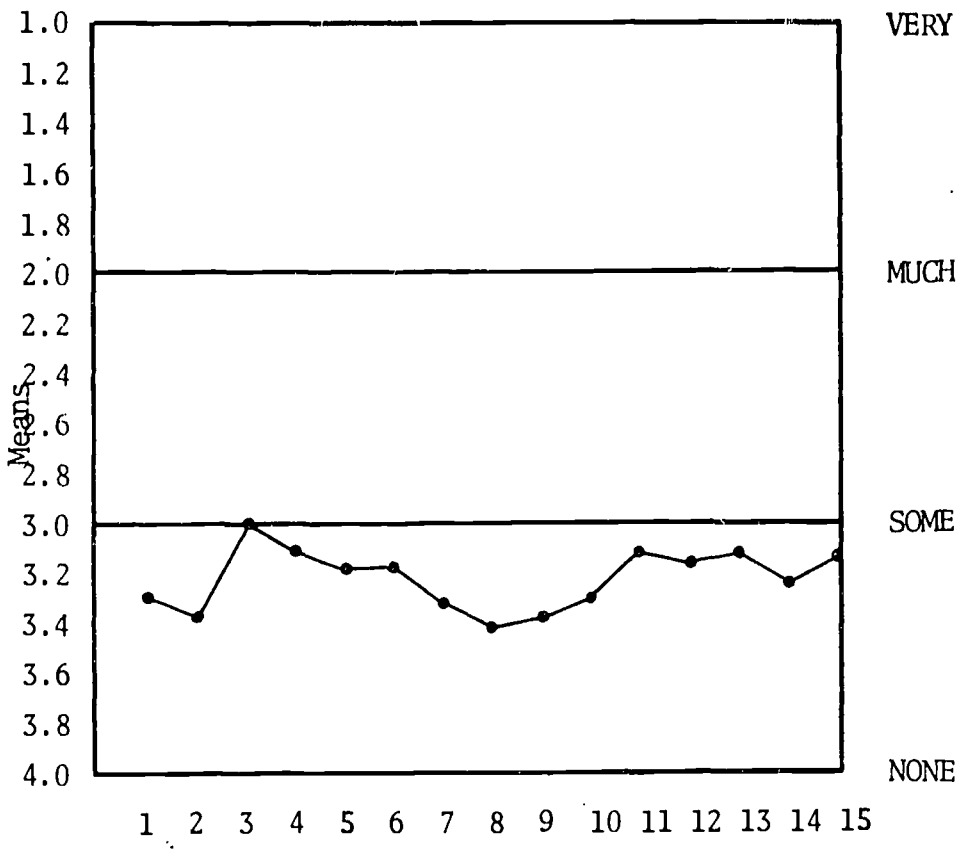
FIGURE - 49



PRODUCT DESIGN
(DDT)
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 2.89

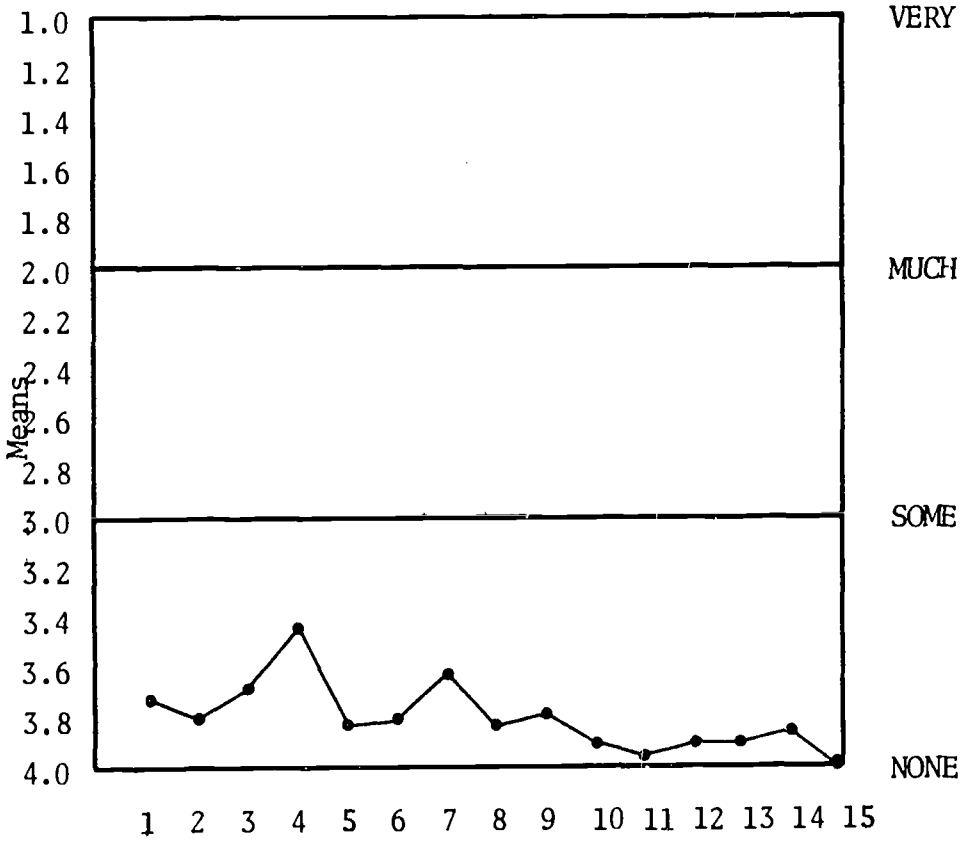
FIGURE - 50



REPORT WRITING
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.21

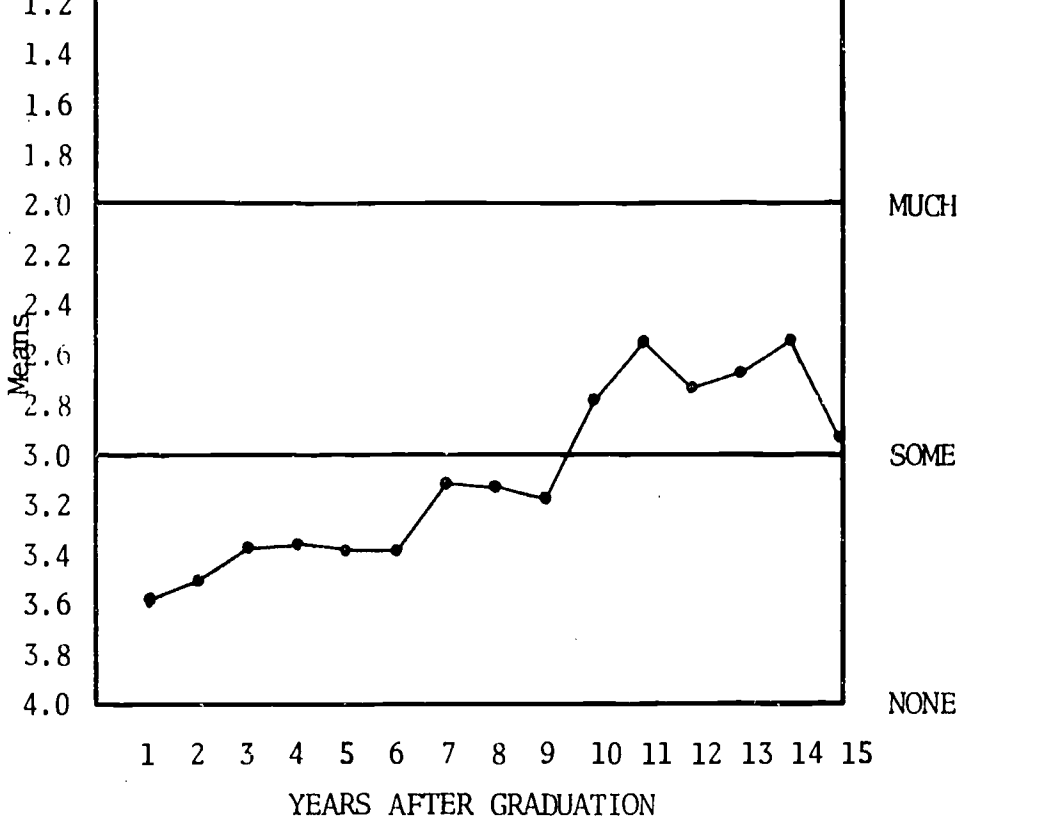
FIGURE - 51



COMPUTER PROGRAM
DDT
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.77

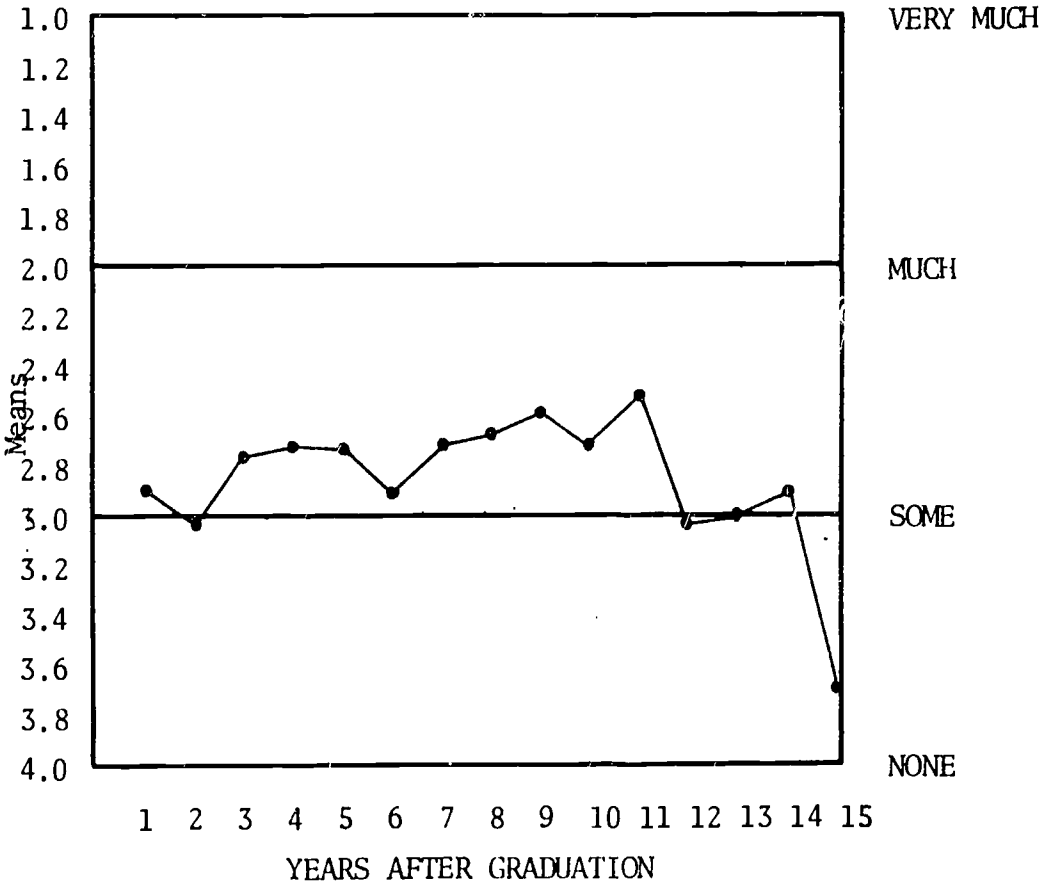
FIGURE - 52



VACUUM TUBES
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.17

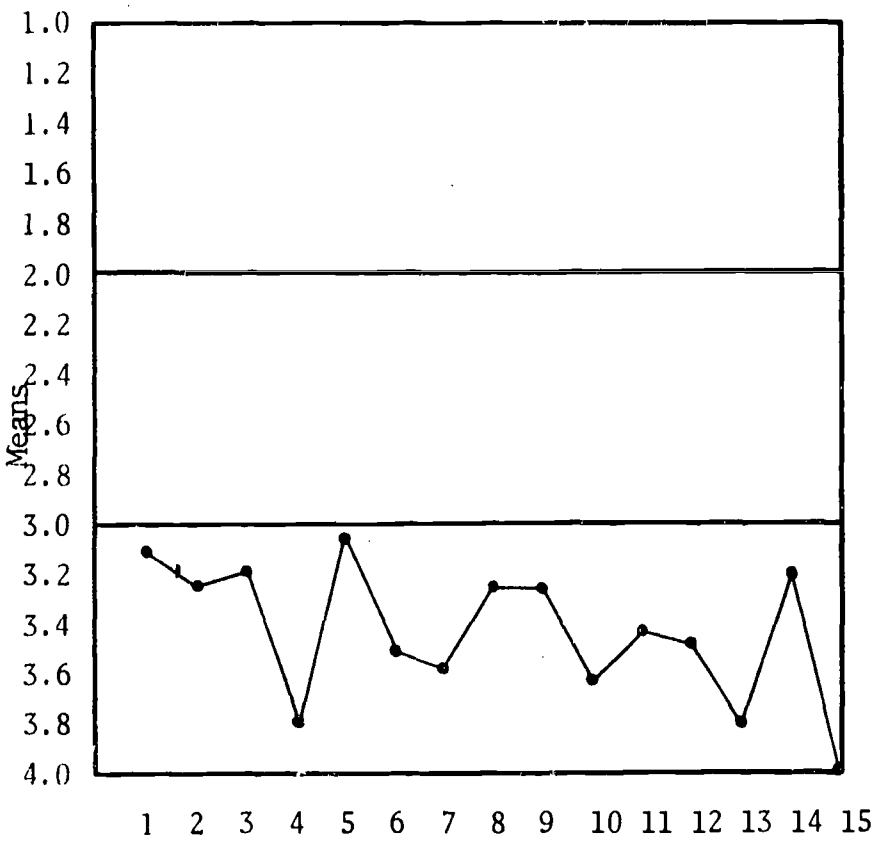
FIGURE - 53



TRANSISTOR
CIRCUITS
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 2.83

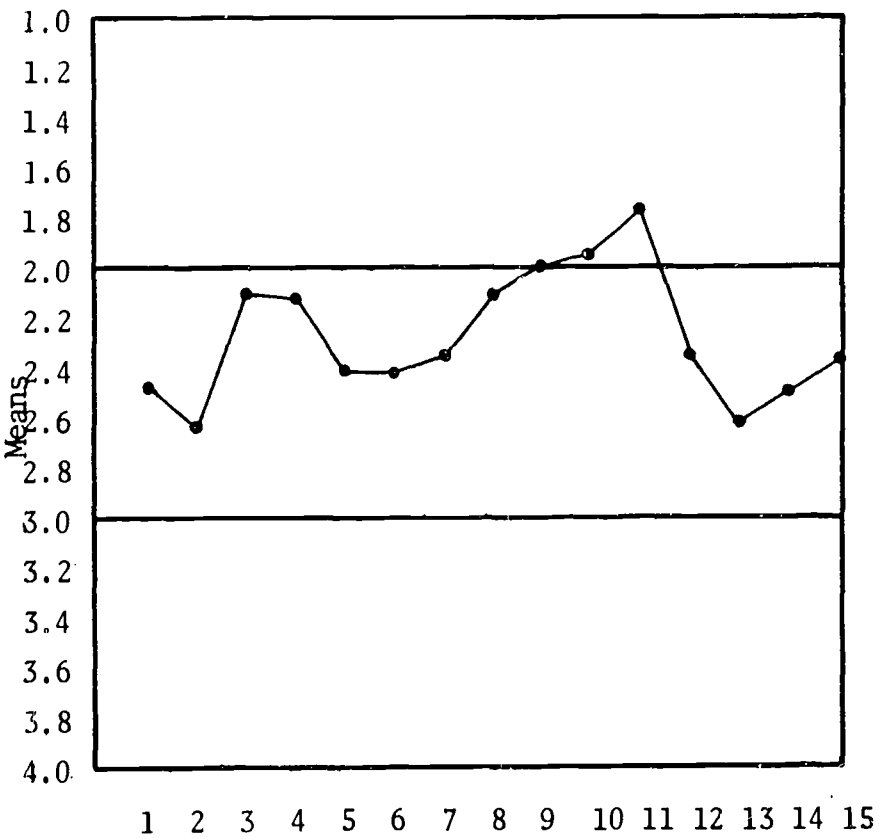
FIGURE - 54



INTEGRATED
CIRCUITS
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.34

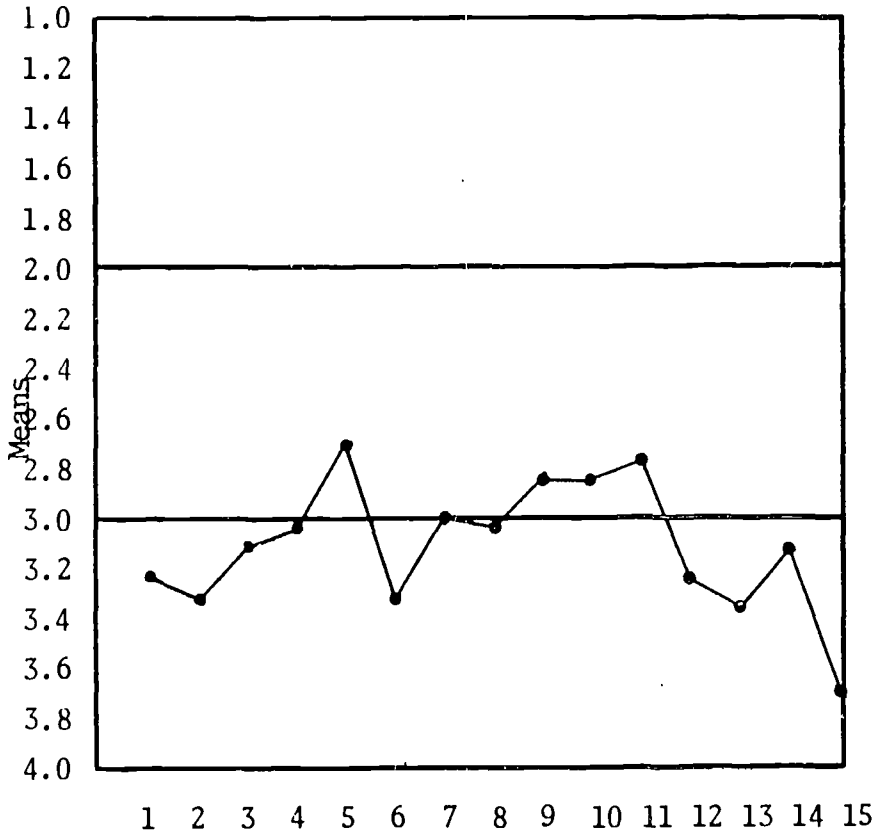
FIGURE - 55



TEST
EQUIPMENT
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 2.30

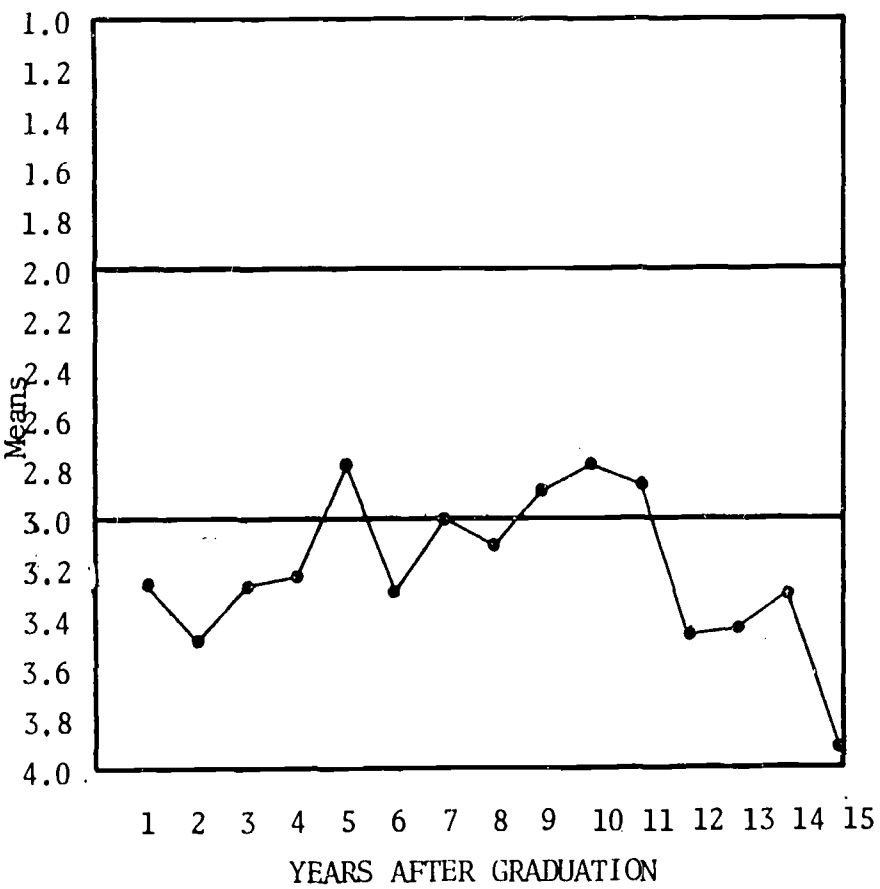
FIGURE - 56



PULSE
CIRCUITS
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.10

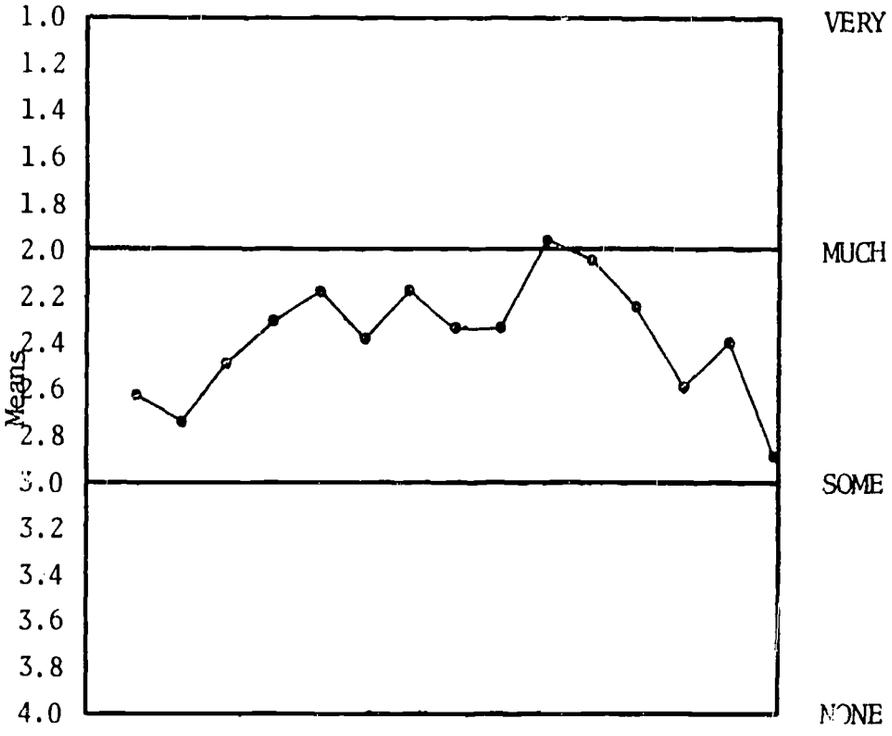
FIGURE - 57



LOGIC
CIRCUITS
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.20

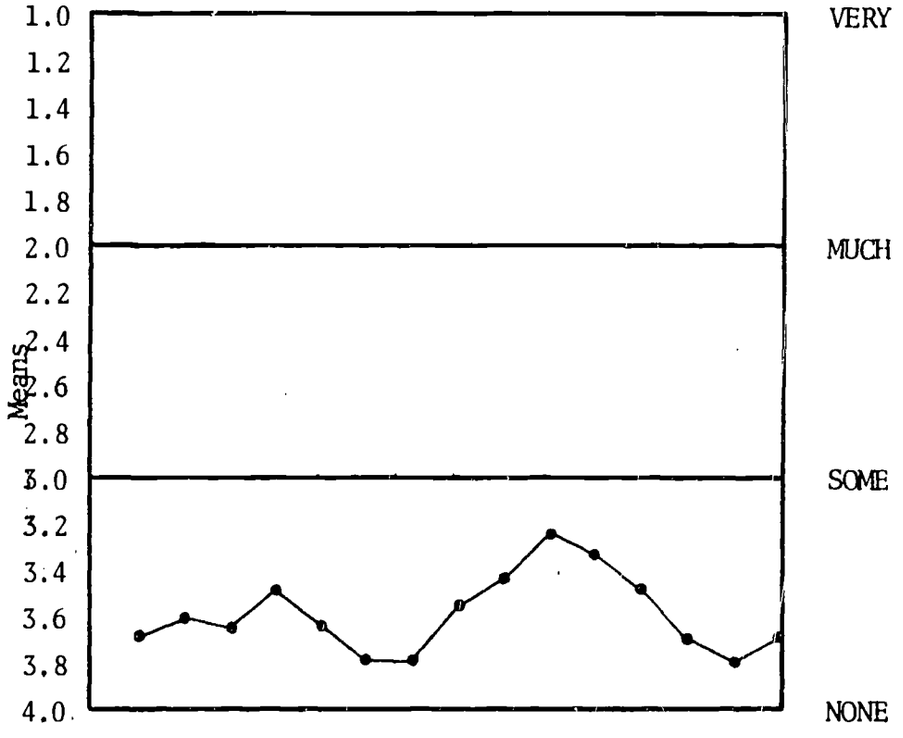
FIGURE - 58



TROUBLE SHOOTING
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 2.40

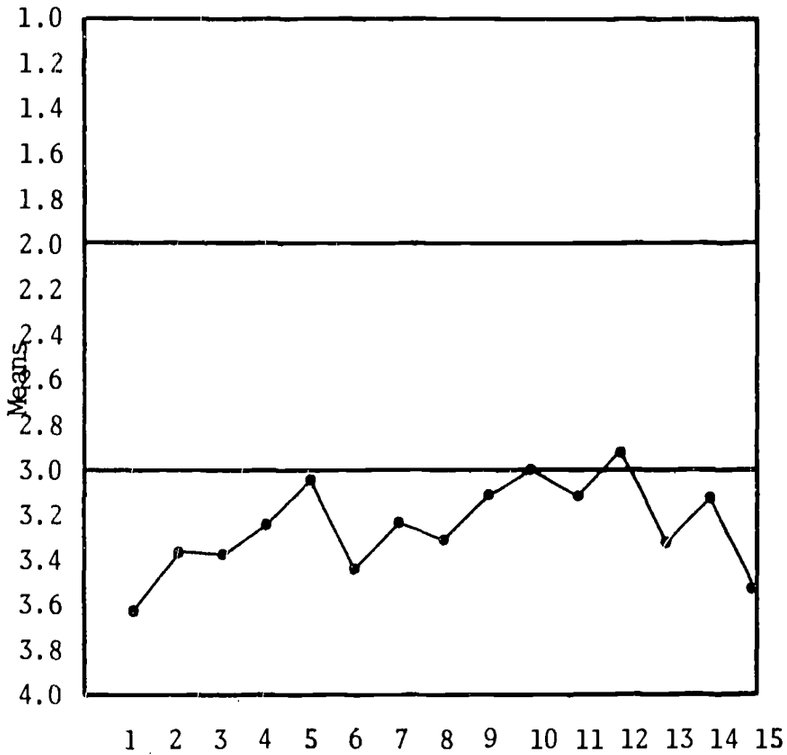
FIGURE - 59



MICROWAVE THEORY
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.59

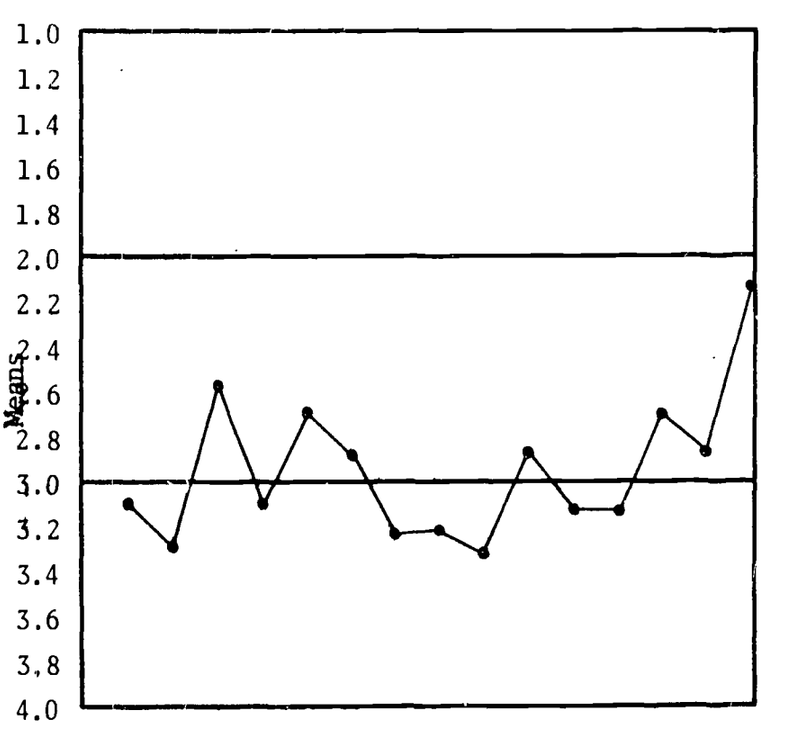
FIGURE - 60



COMMUNICATIONS
CIRCUITS
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.27

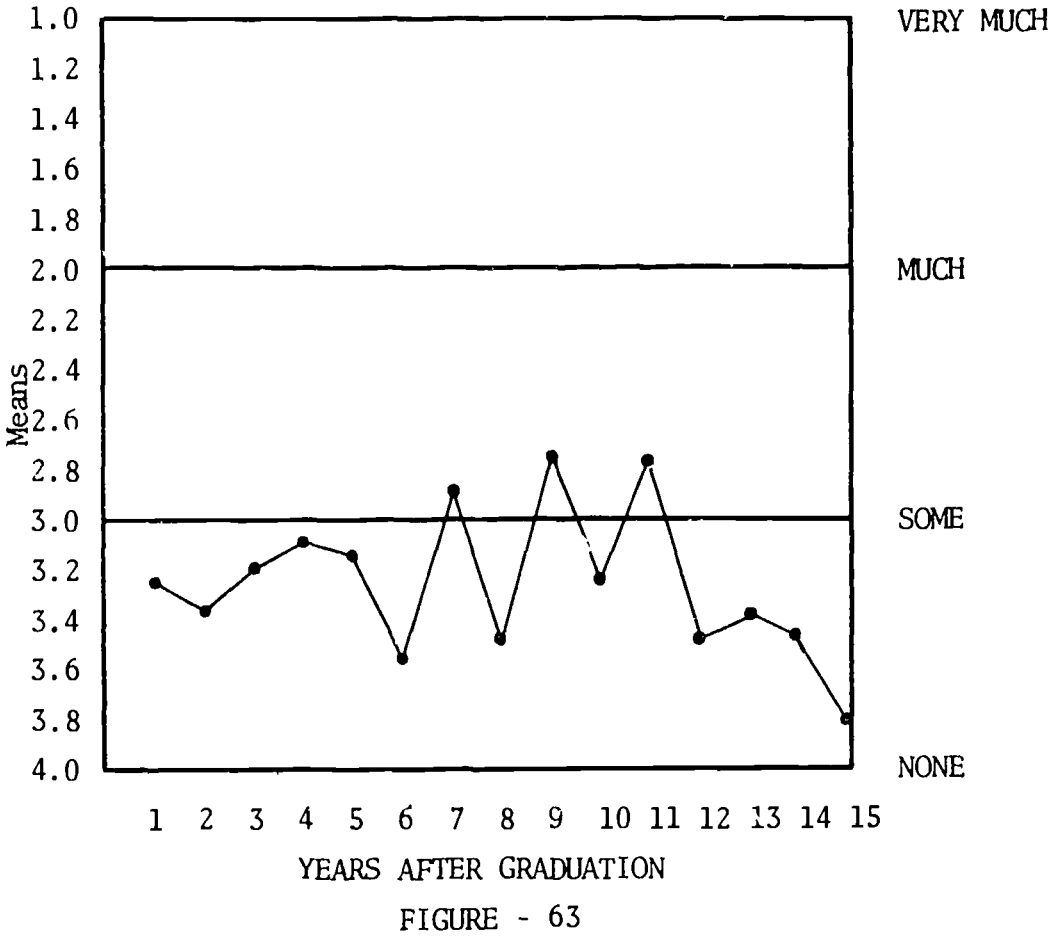
FIGURE - 61



INDUSTRIAL
CIRCUITS
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.03

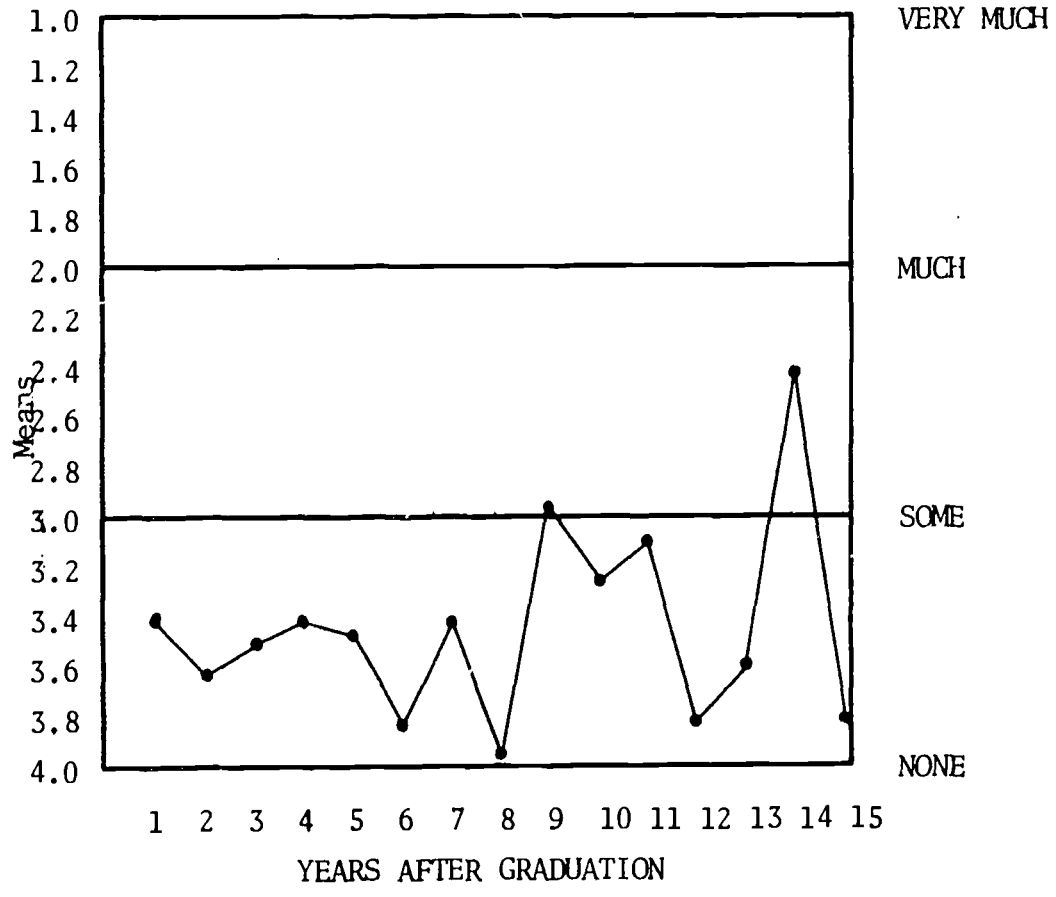
FIGURE - 62



BINARY
ARITHMETIC
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.26

FIGURE - 63



BOOLEAN ALGEBRA
EET
IMMEDIATE NEED
AFTER GRADUATION

15 YEAR MEAN = 3.48

FIGURE - 64

NEED FOR COURSEWORK NOW

The respondents were also asked to make judgmental responses relative to the extent to which they need the coursework on their present jobs. Responses of this type were obtained for the four basic courses and the twelve special topics within each of the two curriculums (EET and DDT). The graduates were asked to judge each of the 16 items by use of the value terms of very much, much, some, and none. These were in turn converted into numerical values so as to enable us to compute means. The conversions were:

very much = 1

much = 2

some = 3

none = 4

The means for each graduation group by curriculum are graphically displayed in Figures 65 through 96. Tables of Means and Standard Deviations are found in the Appendix III. It should be noted that the graphs are plotted in such a manner that the means indicating higher ratings (which are numerically smaller) are placed highest on the y-axis. Therefore the y-axis begins with 4.0 at the origin and numerically decreases to 1.0. The y-axis is then subdivided into the three categories of "very much-much," "much-some," and "some-none," (which are the terms to which the graduates responded in the questionnaire). The x-axis is marked off in number of years after graduation. Therefore "1" represents the graduation class of 1969 and "15" is the graduation class of 1955.

The following paragraphs describe the findings for the Need for Coursework Now.

Basic Courses - DDT: The Need Now values assigned to the four basic courses by the graduates of the DDT curriculum by the years are displayed in Figures 66, 68, 70, and 72. It is seen that Mathematics Need Now was in the "very much to much" range throughout the fifteen graduation groups and there was little observable difference as a function of the number of years since graduation. The Science Need Now responses all fell within the "much to some" range. Examination of the graph shows a slight upward trend in the value assigned as a function of years after graduation (i.e. the technicians who had been out of school the longest tended to assign higher values to the need for Science on the present job). A similar, but more pronounced, trend is seen for the topic of English Need Now. The more recent graduates rated it in the "much to some" range while the older graduates placed it in the "very much to much" category. Social Science Need Now had a similar trend as English with the older graduation groups rating it in the "much to some" range while the more recent graduates placed it in the "some to none" category.

In conclusion: Mathematics Need Now was stable in its rating by the DDT graduates of fifteen years in the "very much to much" category. The other three topics (Science, English, Social Sciences) Need Now were rated lowest by the more recent graduation classes and received higher ratings by the older groups.

Basic Courses - EET: The Need Now values assigned to the four basic courses by the graduates of the EET curriculum over the fifteen years are displayed in Figures 65, 67, 69 and 71. The Mathematics Need Now is consistently rated lower by this group than was found to be the case for the DDT graduates. Only five of the fifteen classes have rated it in the "very much to much" category. The other ten graduation groups rated it in the "much to some" region. The Science Need Now responses all fell within the "much to some" range, with most of them in the middle of it. The English Need Now was rated highest by the graduation classes that have been out the longest. The more recent classes, as a whole rated this in the "much to some" category, while the older classes placed it in the lower part of the "very much to much" category. Social Science Need Now followed the same trend, but in lower ranges throughout. The three most recent graduation groups rated it in the upper portion of the "some to none" region while the remaining groups placed it in the "much to some" category.

In conclusion: Mathematics Need Now and Science Need Now were stable in their ratings by the EET graduates of fifteen classes. For the most part, these ratings were in the "much to some" categoreis. Both English Need Now and Social Science Need Now were rated highest by the older groups.

Twelve Special Topics - DDT: The Need Now values assigned to the twelve special DDT topics by the fifteen graduation groups are displayed in Figures 73 through 84. Tables of Means and Standard Deviations are found in Appendix III. Sketching Need Now is given slightly higher ratings by the older groups, although all but one remain in the "much to some" category. The ratings found for Layout Need Now do not follow a distinguishable pattern. All but one graduation group rated this topic in the "much to some" category. Graphic Solutions Need Now received ratings that ranged from the bottom of the "much to some" category to the top of the "some to none" region, with no distinguishable trend. Valued in the "some to none" category were all but one of the fifteen ratings for Kinematics Need Now. Again, no discernable trend as a function of years after graduation has been found.

The values assigned to Strength of Materials Need Now increased with years after graduation. All ratings remained in the "much to some" category. A slight upward trend was found for the Static Analysis Need Now ratings as a function of years after graduation. No distinguishable trends were found for Dynamic Analysis Need Now and Analysis of Structures Need Now. Both these topics received values at the bottom of the "much to some" range and top of the "some to none" category.

Clearly discernible upward trends in the values assigned to Manufacturing Processes Need Now, Product Design Need Now, and Report Writing Need Now was found. In most cases, the ratings moved from the lower portion to the upper portion of the "much to some" category with increases in years

after graduation. Computer Programming was values in the "some to none" range with no distinguishable trend as a function of years after graduation.

In conclusion: Several of the special DDT topics received higher values from the earlier graduates than the more recent graduates. These topics included: Sketching, Strength of Materials, Static Analysis, Manufacturing Processes, Product Design, and Report Writing. No discernible trend as a function of years after graduation was found for the other five special topics.

Twelve Special Topics - EET: The Need Now values assigned to the twelve special EET topics by the fifteen graduation groups are displayed in Figures 85 to 96. The Need Now values assigned for Vacuum Tubes remained fairly constant in the "none to some" category. The value of Transistor Circuits Need Now also displayed no overall change as a function of years after graduation, but the value range was between "much to some." A slight upward trend for Integrated Circuits Need Now was found, with the values remaining in the "much to some" category. A weak downward trend was found for Test Equipment Need Now, where the more recent graduates rated it more highly than the older graduates. All values remained in the "much to some" category.

No discernible overall trend as a function of years after graduation was found for the present need for Pulse Circuits and Logic Circuits. Although the value for most graduation groups was in the "much to some" region, there were several classes where the rating was down in the "some to none" category. Very slight downward trends were observed for the present need for Communication Circuits and Industrial Circuits. In the case of communication circuits, all values were in the "some to none" category. The values given for industrial circuits varied from most of them in the "much to some" category to several in the "some to none" region.

A decided downward trend, as a function of years after graduation, was found for the present need for Microwave Theory. This topic was not rated highly by any graduation group, all values falling within the

"some to none" region. It is interesting to observe however, that the older graduation classes valued it even lower than the more recent groups. A downward trend, but less than found for the above topic, was observed for Trouble Shooting Need Now. This is to say that the older graduates apparently had less need for this technique on their present jobs than is the case for the more recent graduates. All values fell with the "much to some" region. The values assigned by the various graduation groups for Binary Arithmetic Need Now indicates a very slight upward trend, although widely scattered ratings were obtained. Most of the ratings were in the "much to some" region, but two were found in the "very much to much" range and four in the "some to none" category. Boolean Algebra, with most values in the "some to none" range, underwent a slight upward trend as a function of years after graduation.

In conclusion: The topics in which no observable trend as a function of years after graduation was found are Vacuum Tubes, Transistor Circuits, Pulse Circuits, Logic Circuits. Slight upward trends, as a function of years after graduation, was found for the present need for Integrated Circuits, Binary Arithmetic, and Boolean Algebra. Downward trends, in terms of years after graduation, was found for Test Equipment, Communication Circuits, Industrial Circuits, Microwave Theory, Trouble Shooting.

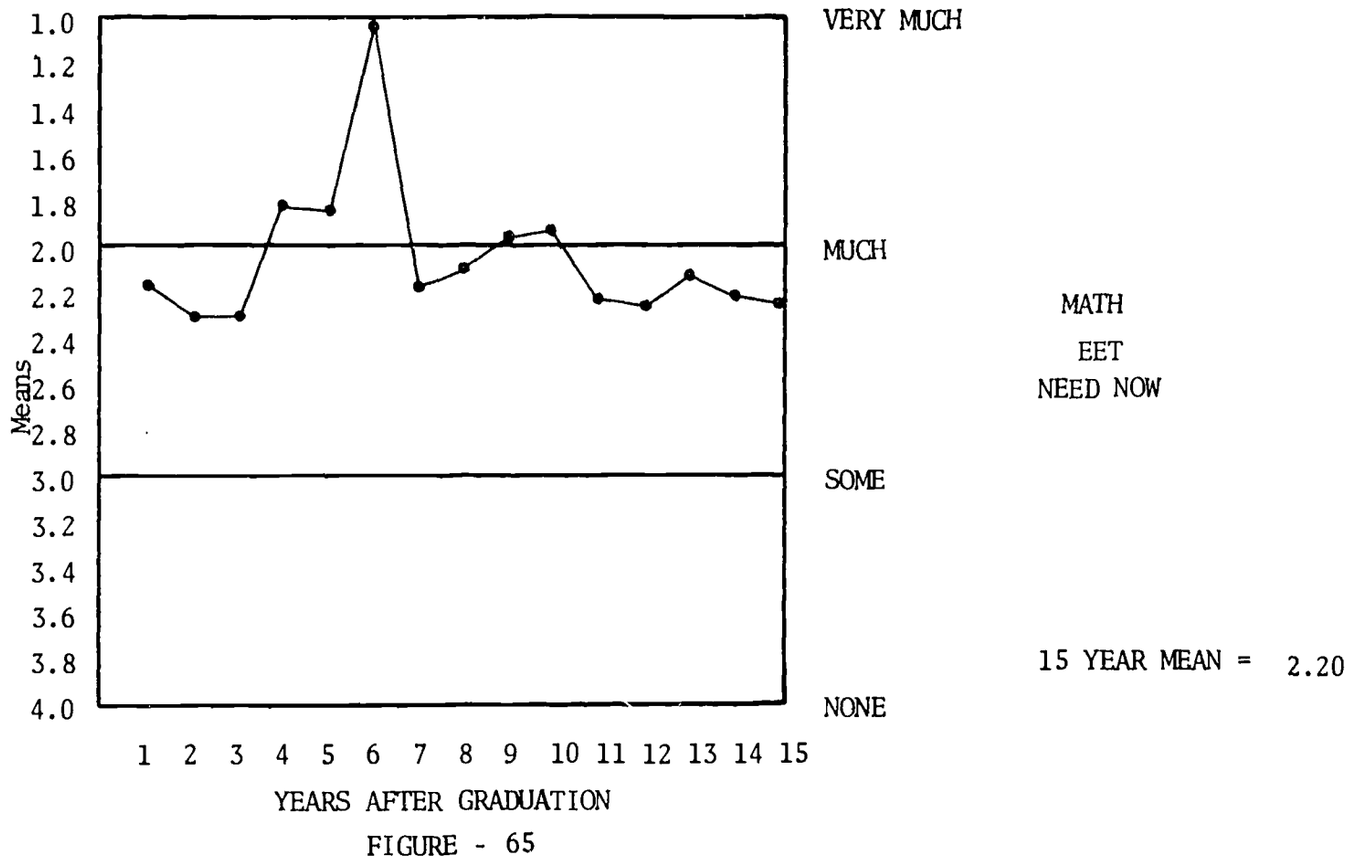


FIGURE - 65

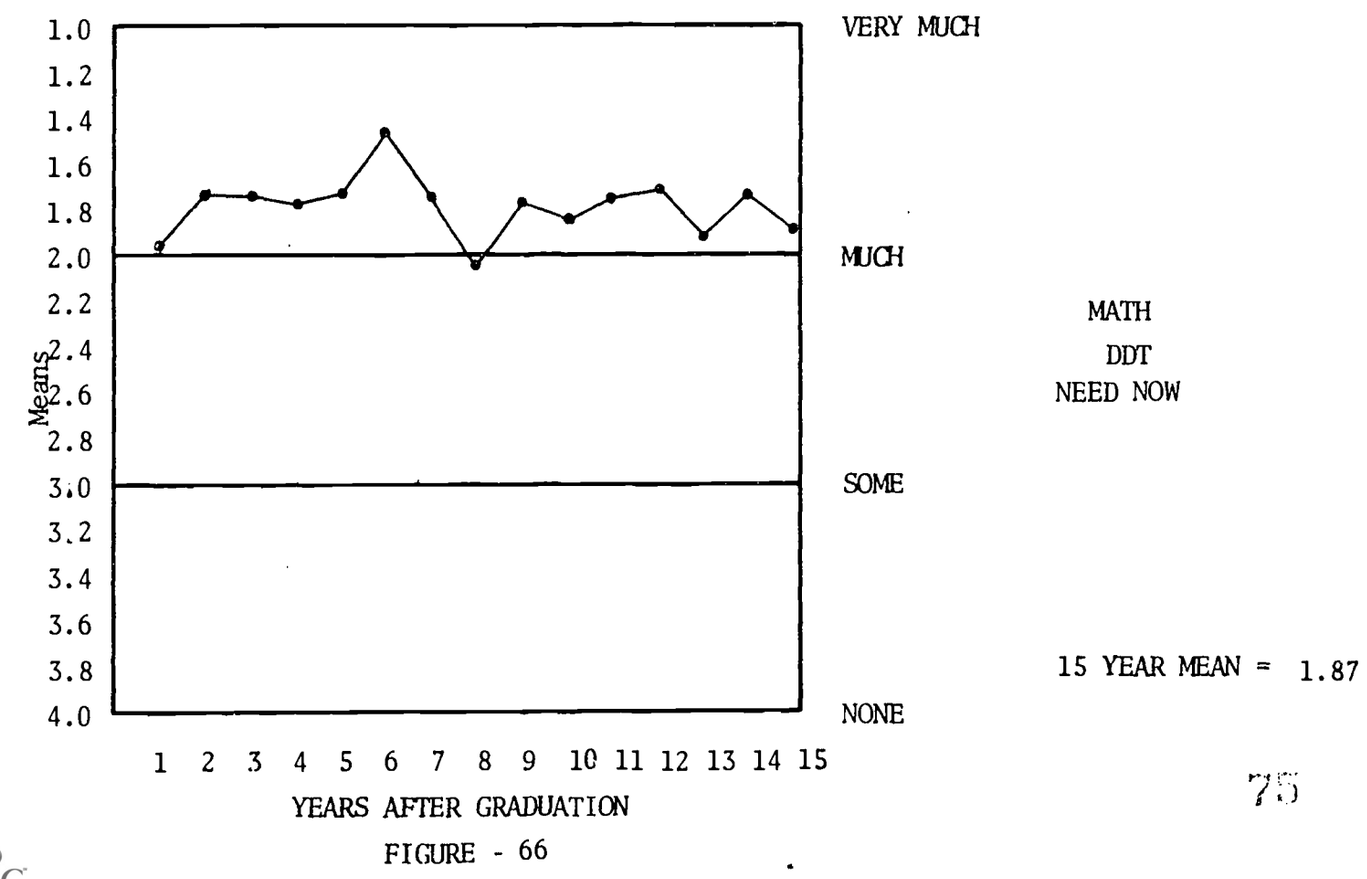


FIGURE - 66

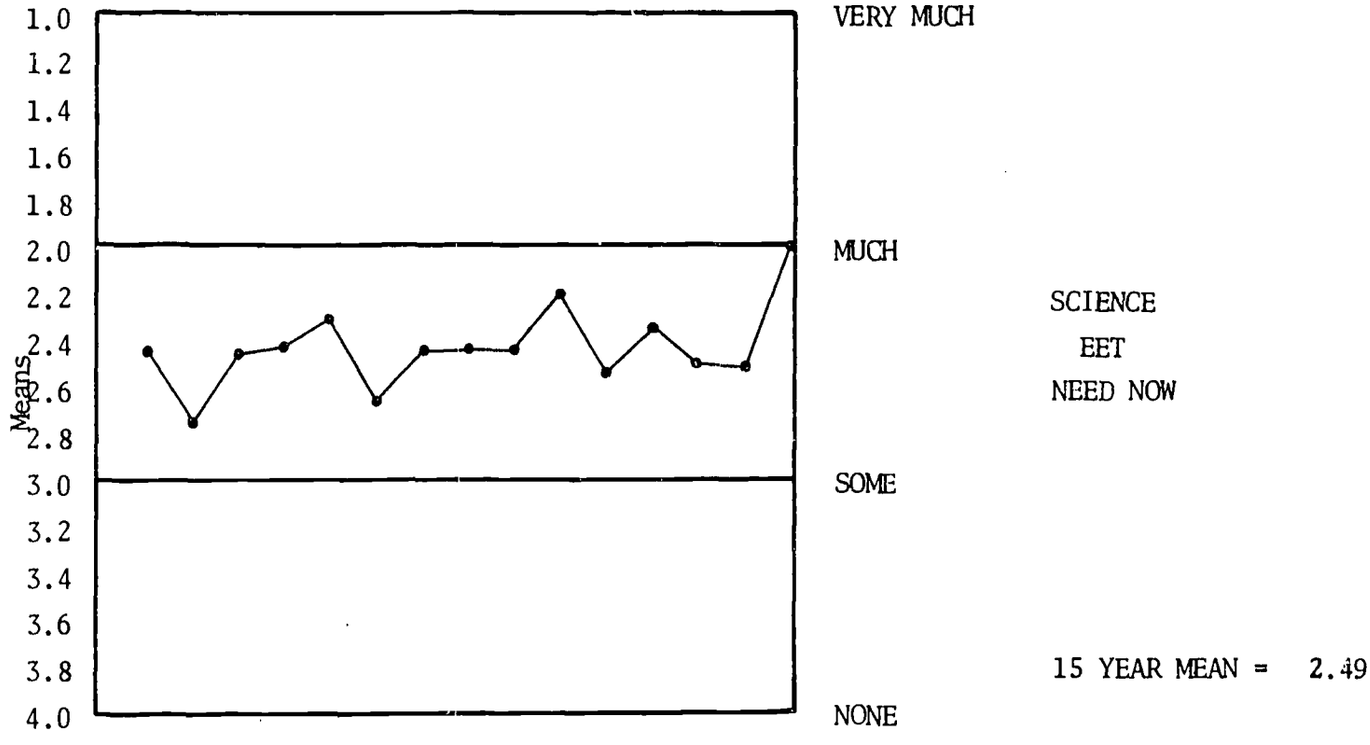


FIGURE - 67

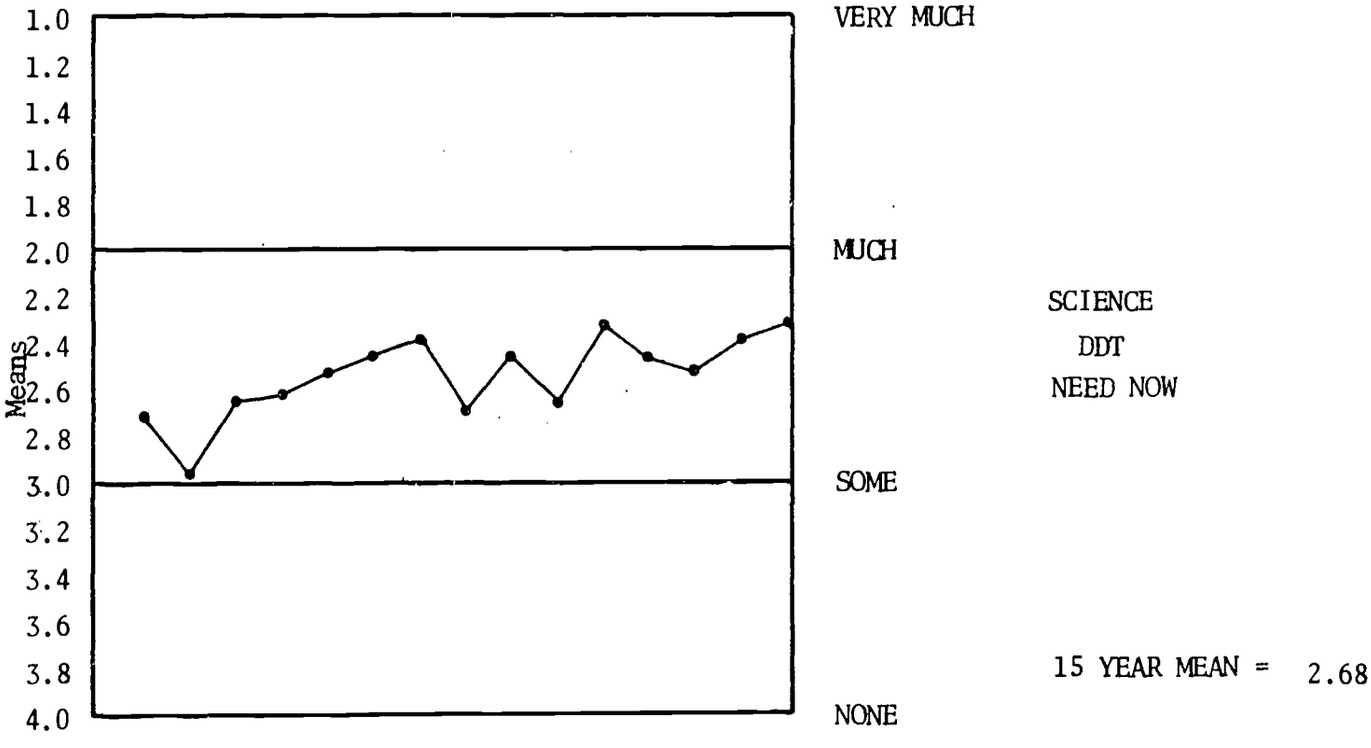
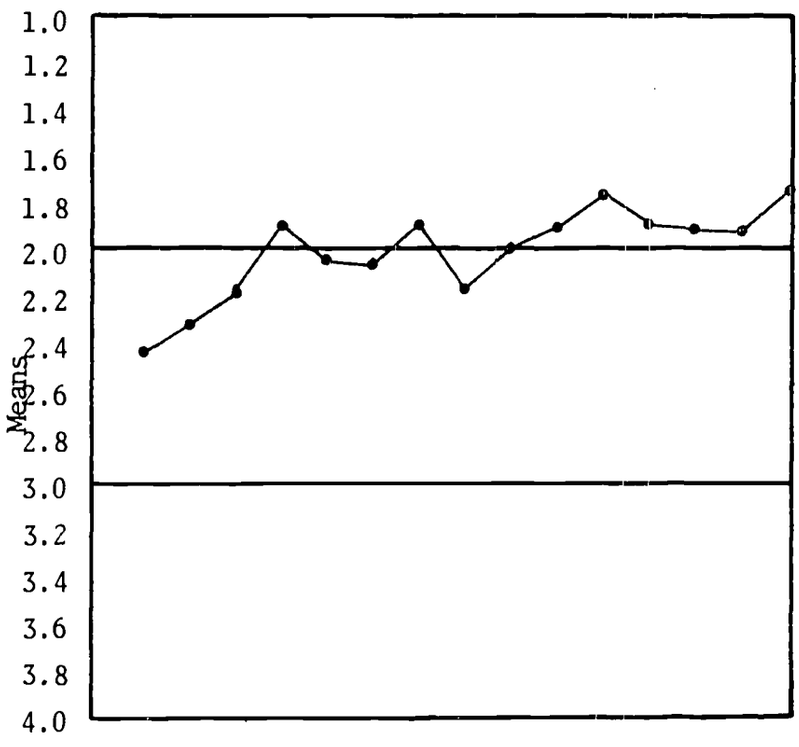


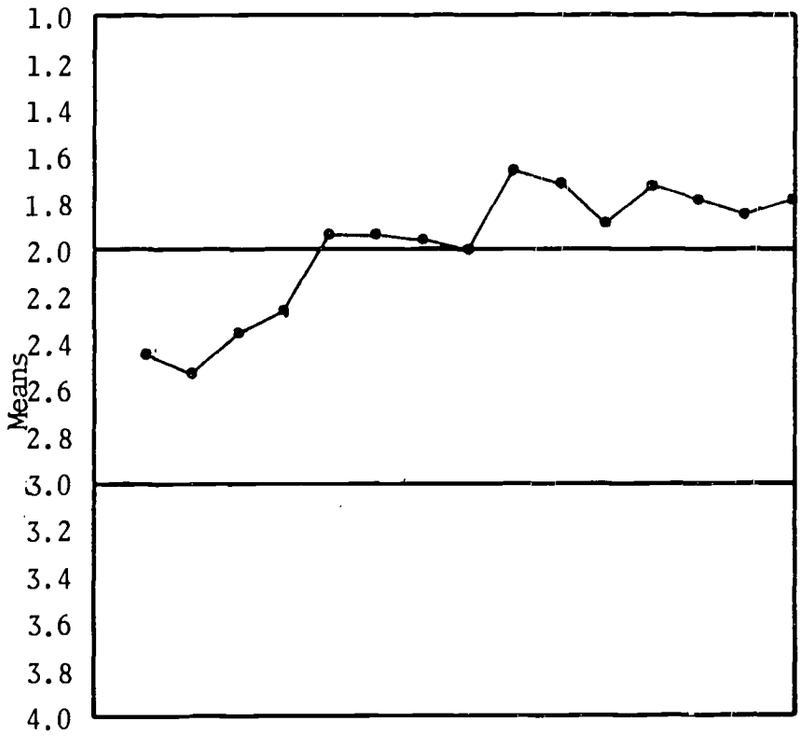
FIGURE - 68



ENGLISH
EET
NEED NOW

15 YEAR MEAN = 2.33

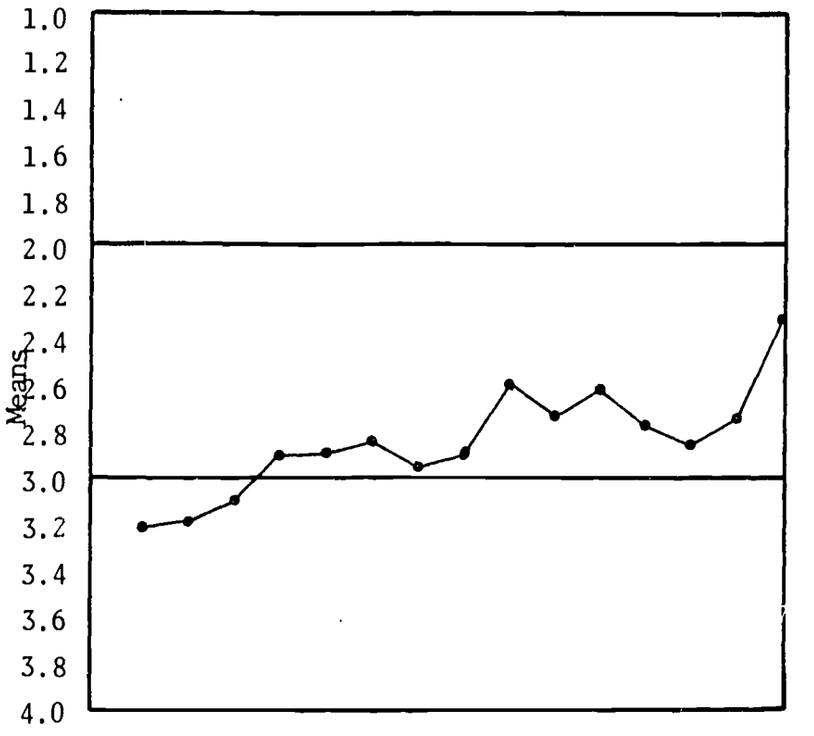
FIGURE - 69



ENGLISH
DDT
NEED NOW

15 YEAR MEAN = 2.39

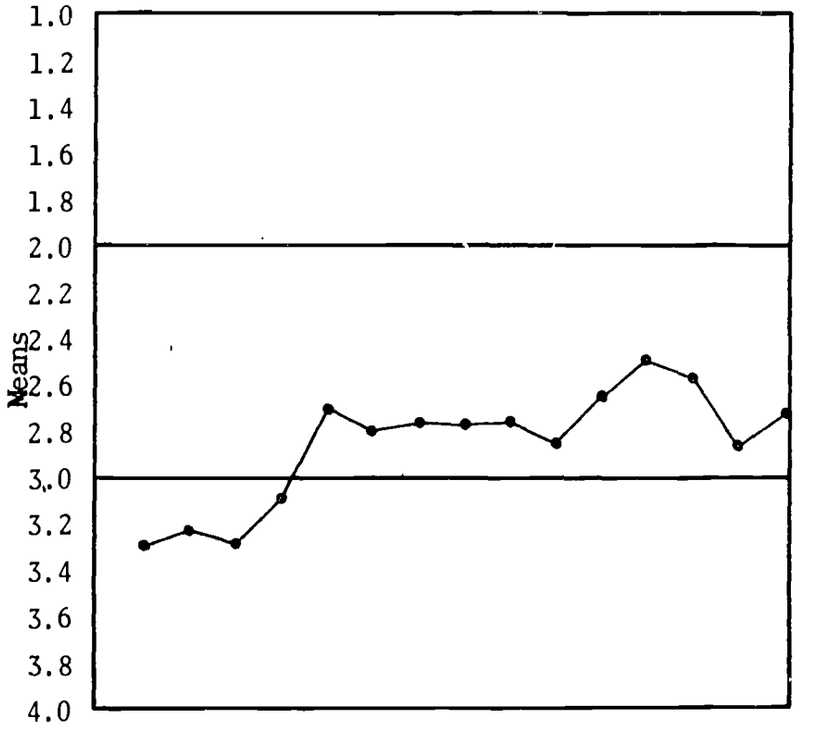
FIGURE - 70



SOCIAL SCIENCE EET NEED NOW

15 YEAR MEAN = 3.16

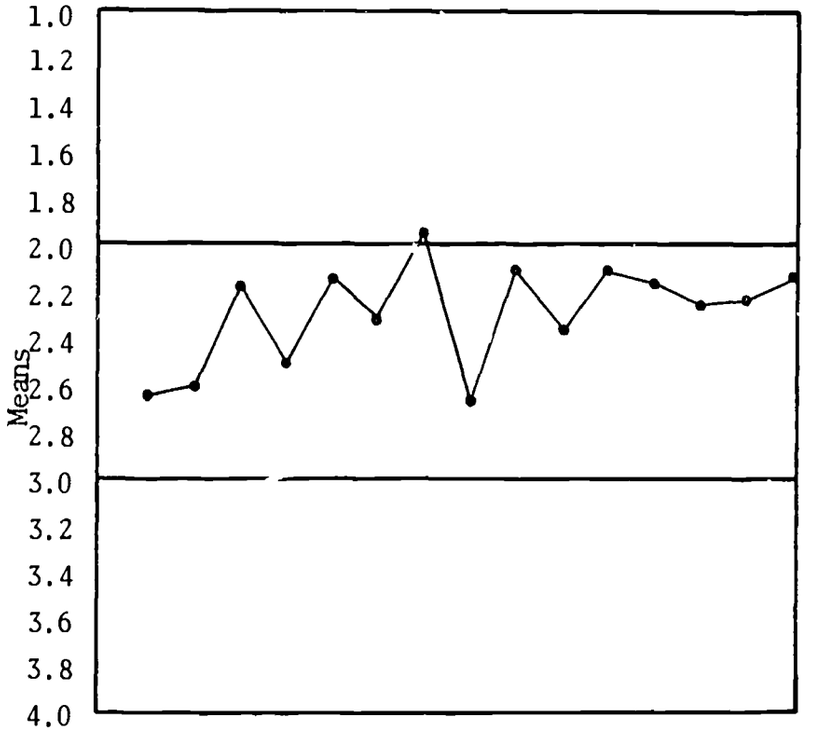
FIGURE - 71



SOCIAL SCIENCE DDT NEED NOW

15 YEAR MEAN = 3.16

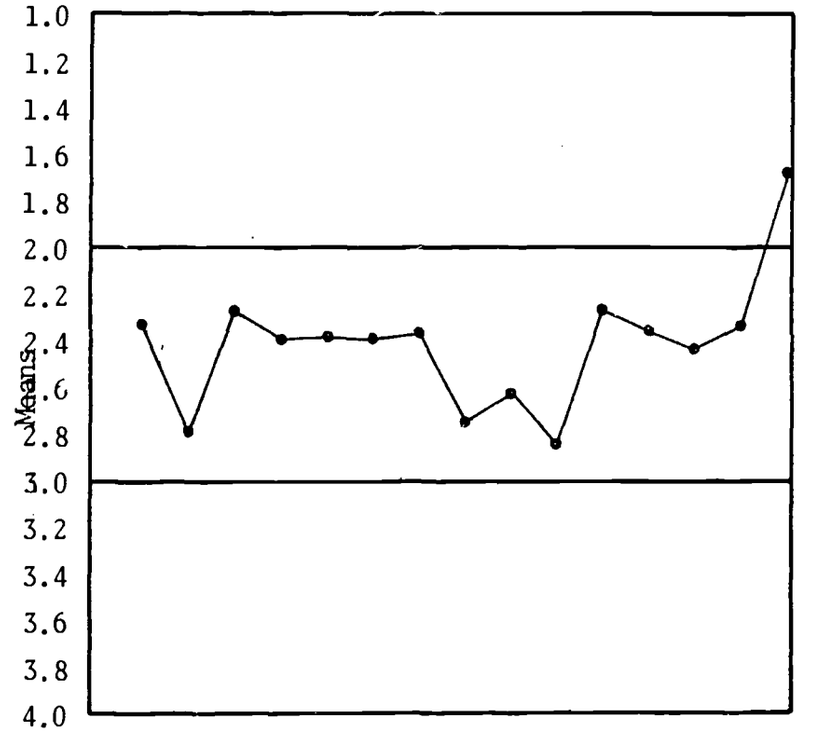
FIGURE - 72



SKETCHING
DDT
NEED NOW

15 YEAR MEAN = 2.60

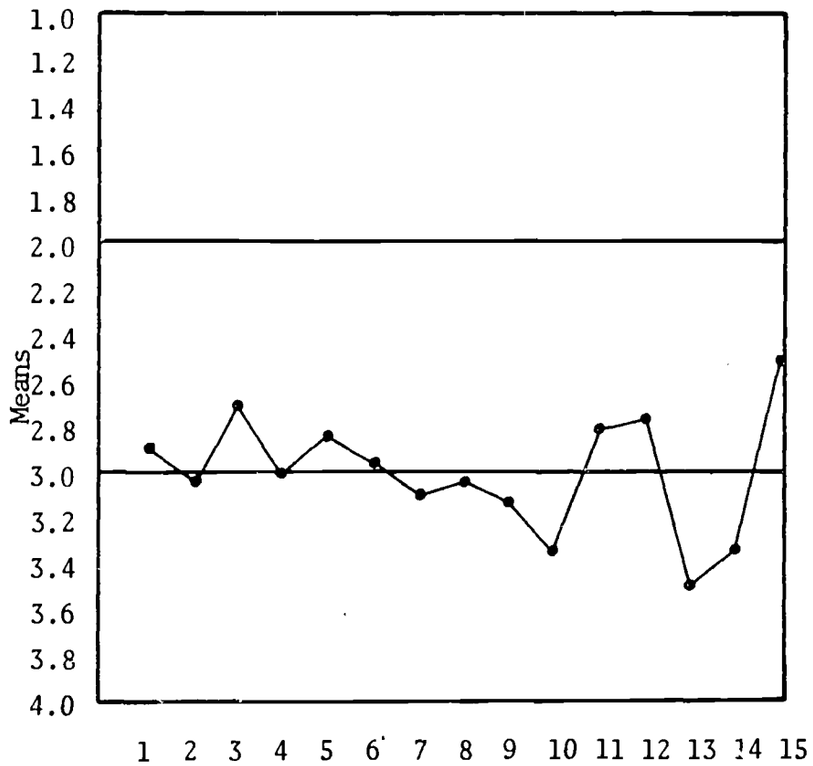
FIGURE - 73



LAYOUT
DDT
NEED NOW

15 YEAR MEAN = 2.13

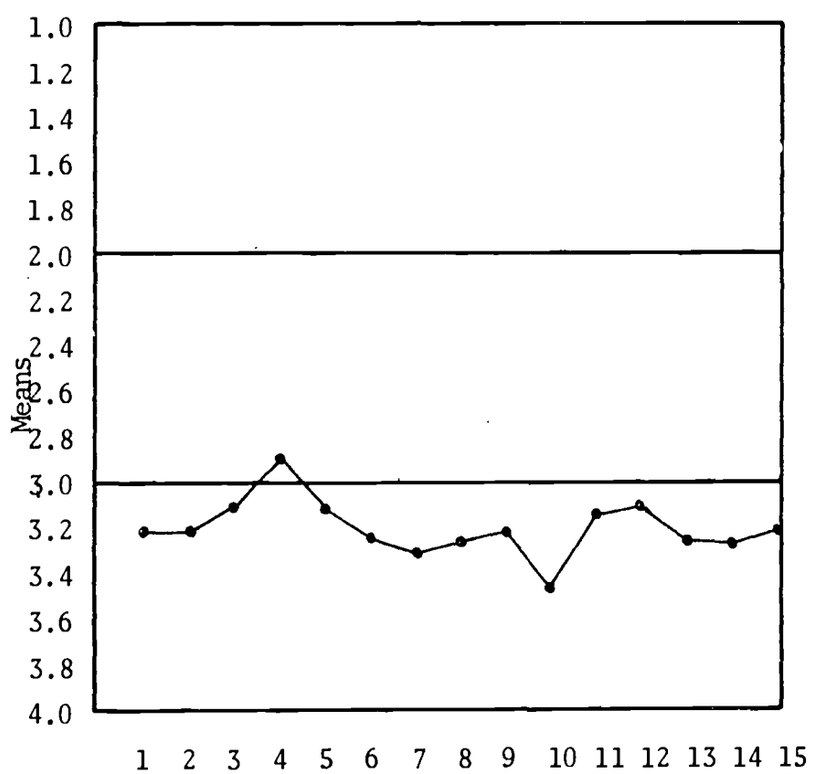
FIGURE - 74



GRAPHIC
SOLUTIONS
DDT
NEED NOW

15 YEAR MEAN = 3.08

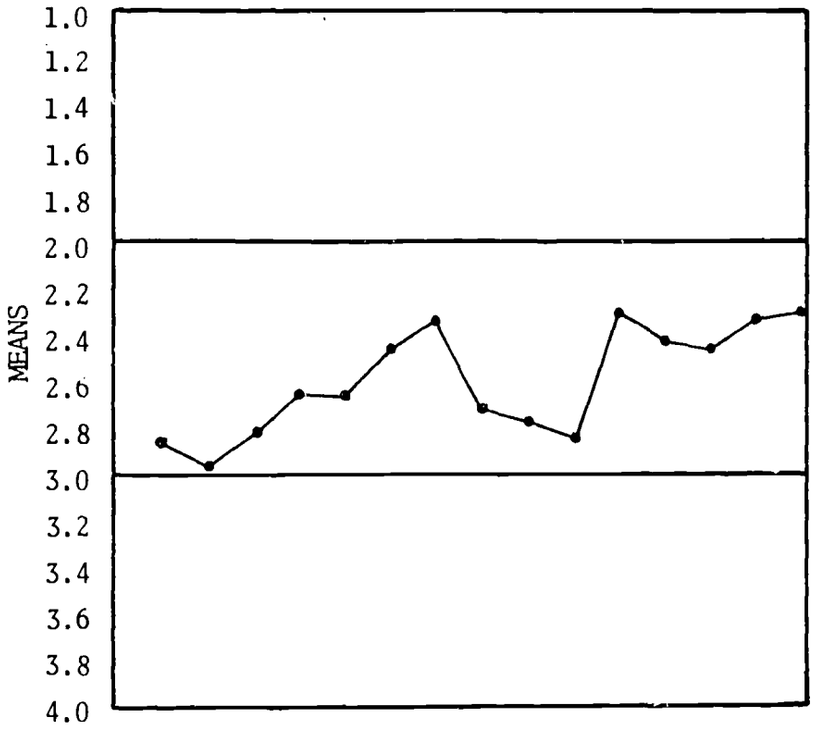
FIGURE - 75



KINEMATICS
DDT
NEED NOW

15 YEAR MEAN = 3.32

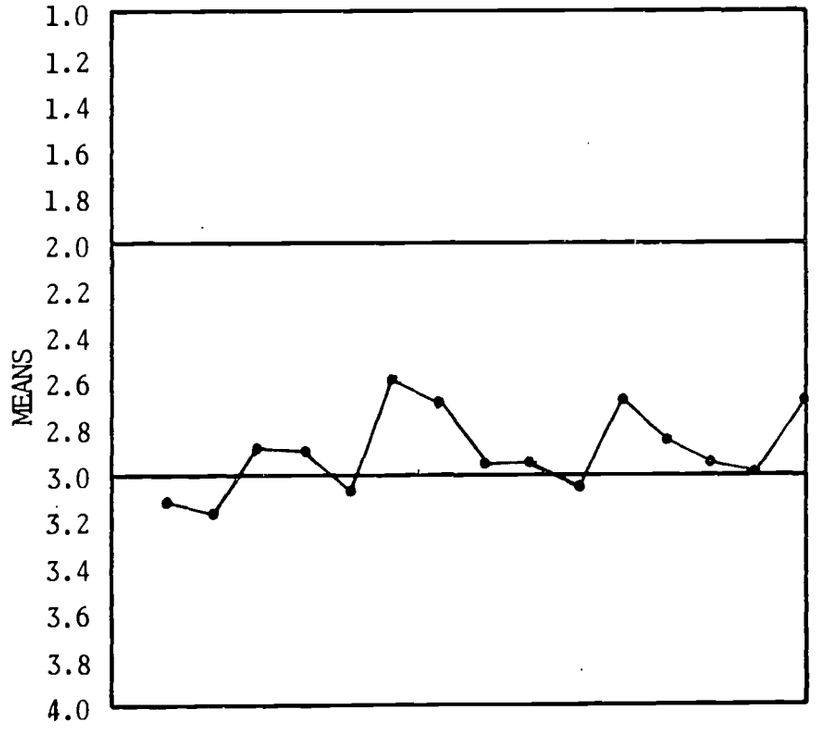
FIGURE - 76



STRENGTH OF MATERIALS
(DDT)
NEED NOW

15 YEAR MEAN = 2.86

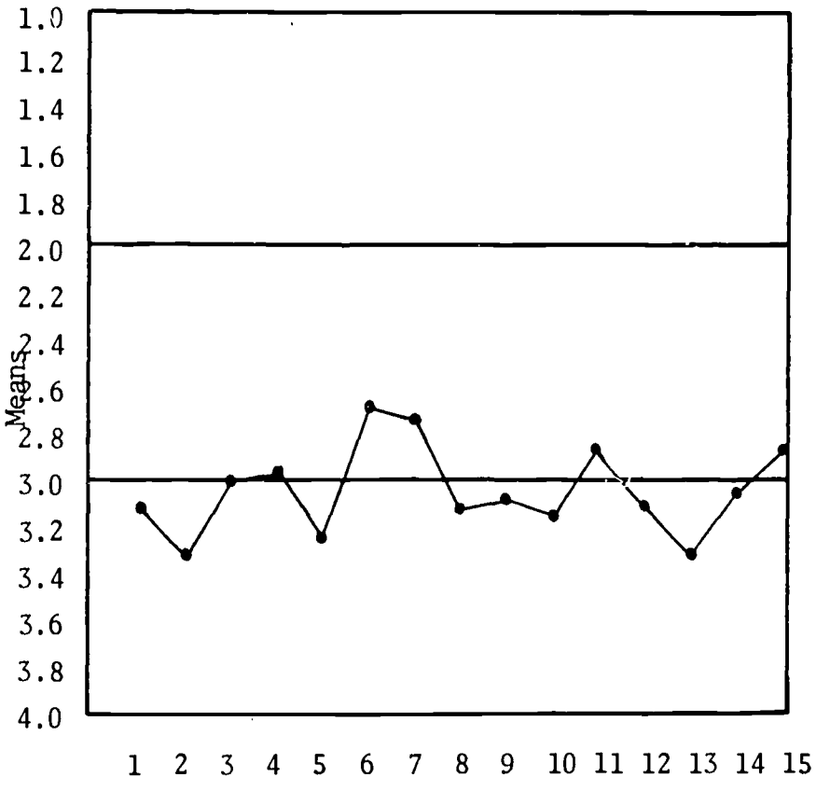
FIGURE - 77



Static Analysis
~~STRENGTH OF MATERIALS~~
(DDT)
NEED NOW

15 YEAR MEAN = 3.17

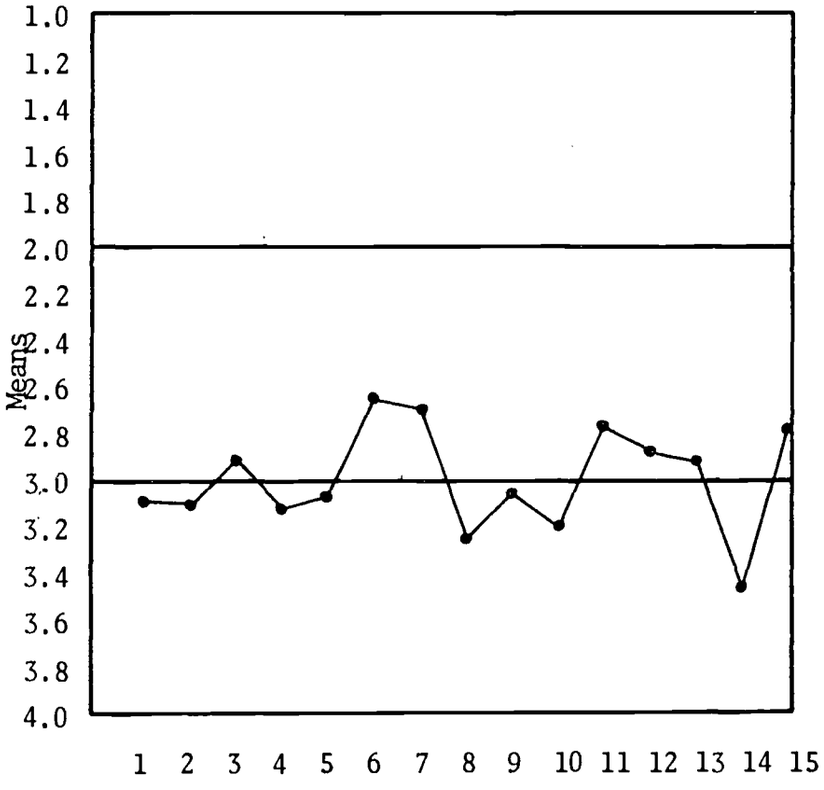
FIGURE - 78



DYNAMIC
ANALYSIS
DDT
NEED NOW

15 YEAR MEAN = 3.32

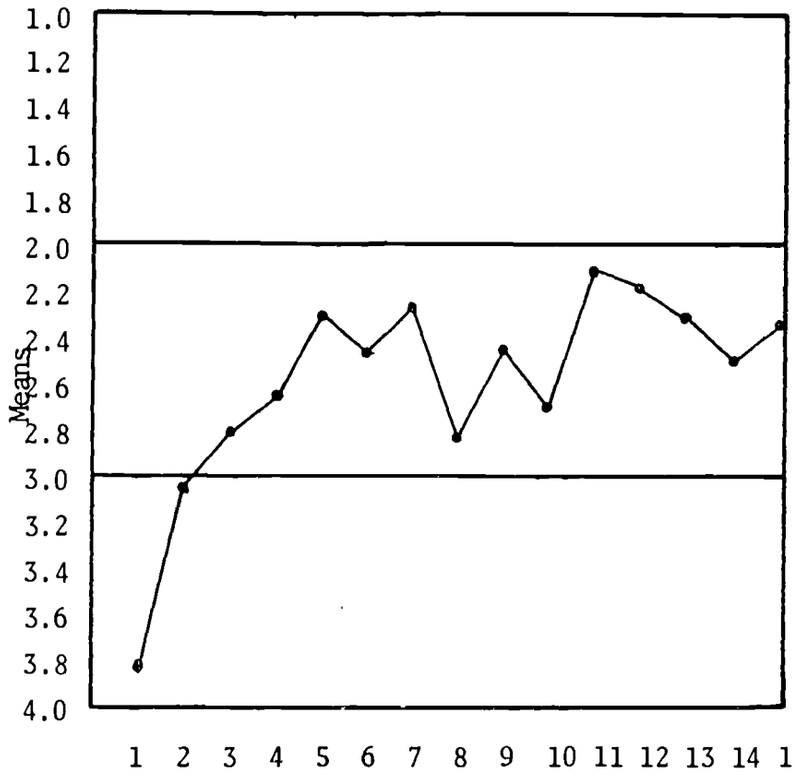
FIGURE - 79



ANALYSIS OF
STRUCTURES
DDT
NEED NOW

15 YEAR MEAN = 3.19

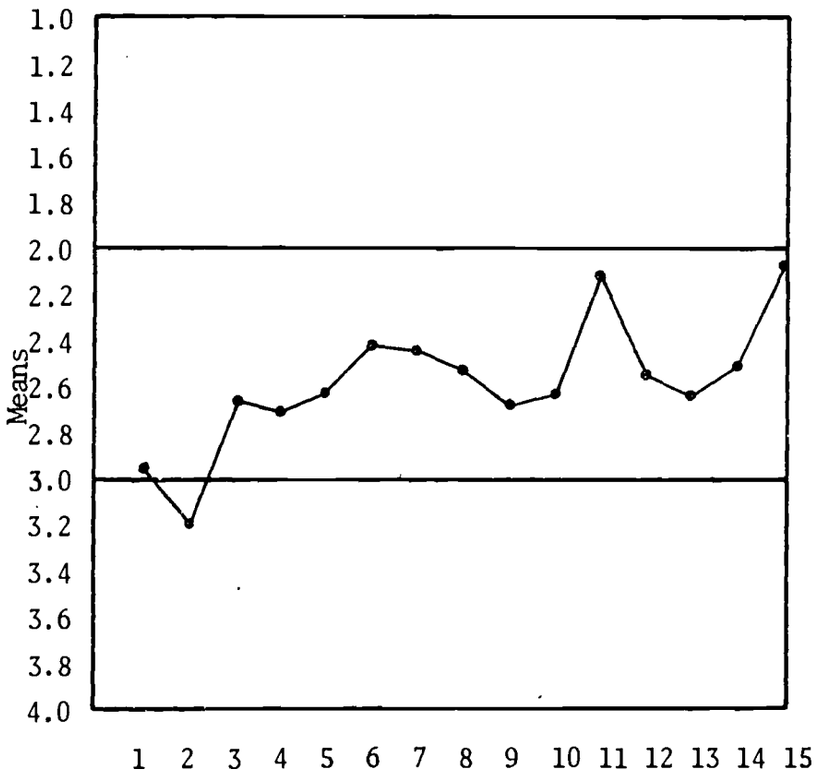
FIGURE - 80



MANUFACTURING PROCESSES DDT NEED NOW

15 YEAR MEAN = 2.93

FIGURE - 81

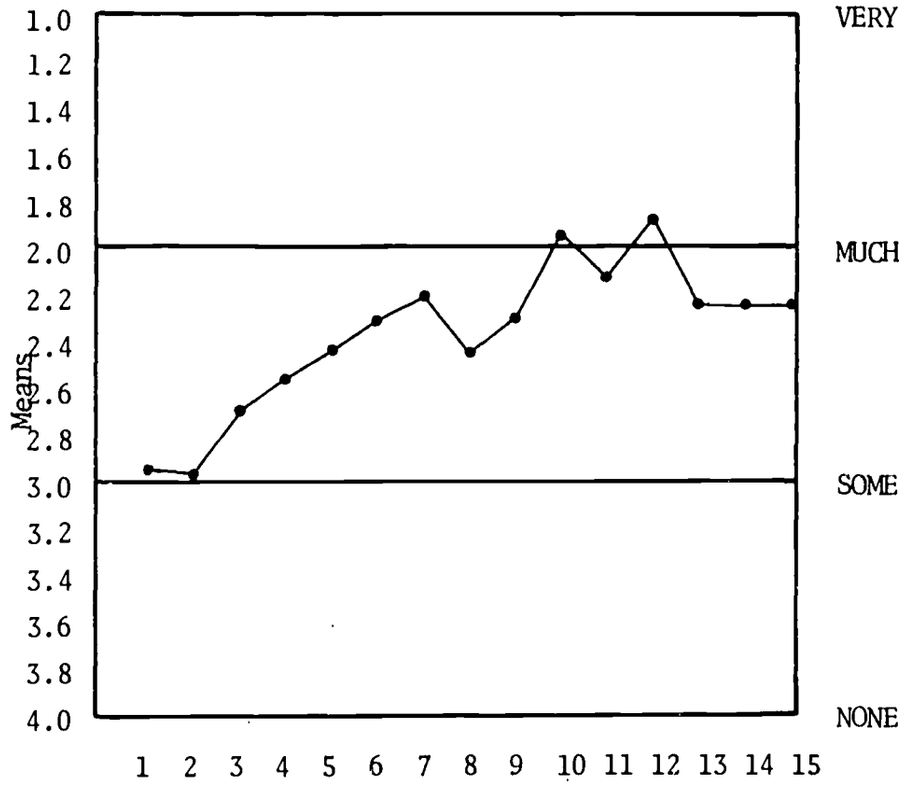


PRODUCT DESIGN

NEED NOW

15 YEAR MEAN = 2.89

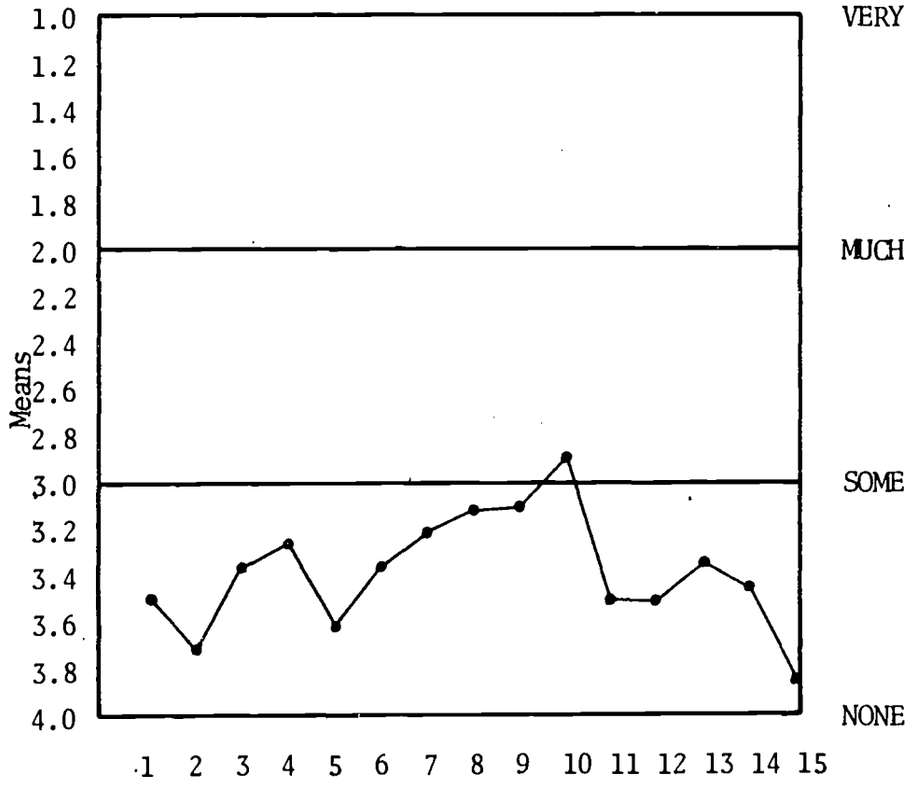
FIGURE - 82



REPORT WRITING DDT NEED NOW

15 YEAR MEAN = 3.21

FIGURE - 83



COMPUTER PROGRAMMING DDT NEED NOW

15 YEAR MEAN = 3.77

FIGURE - 84

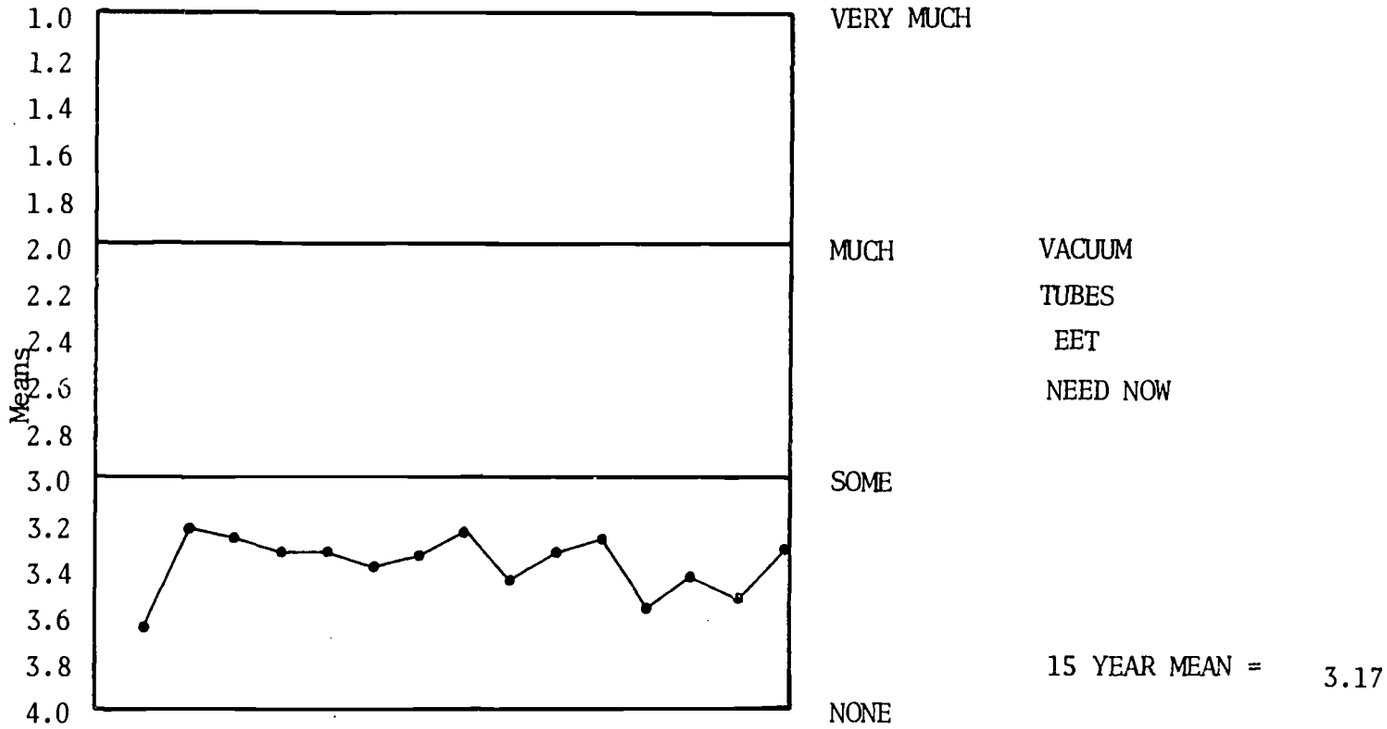


FIGURE - 85

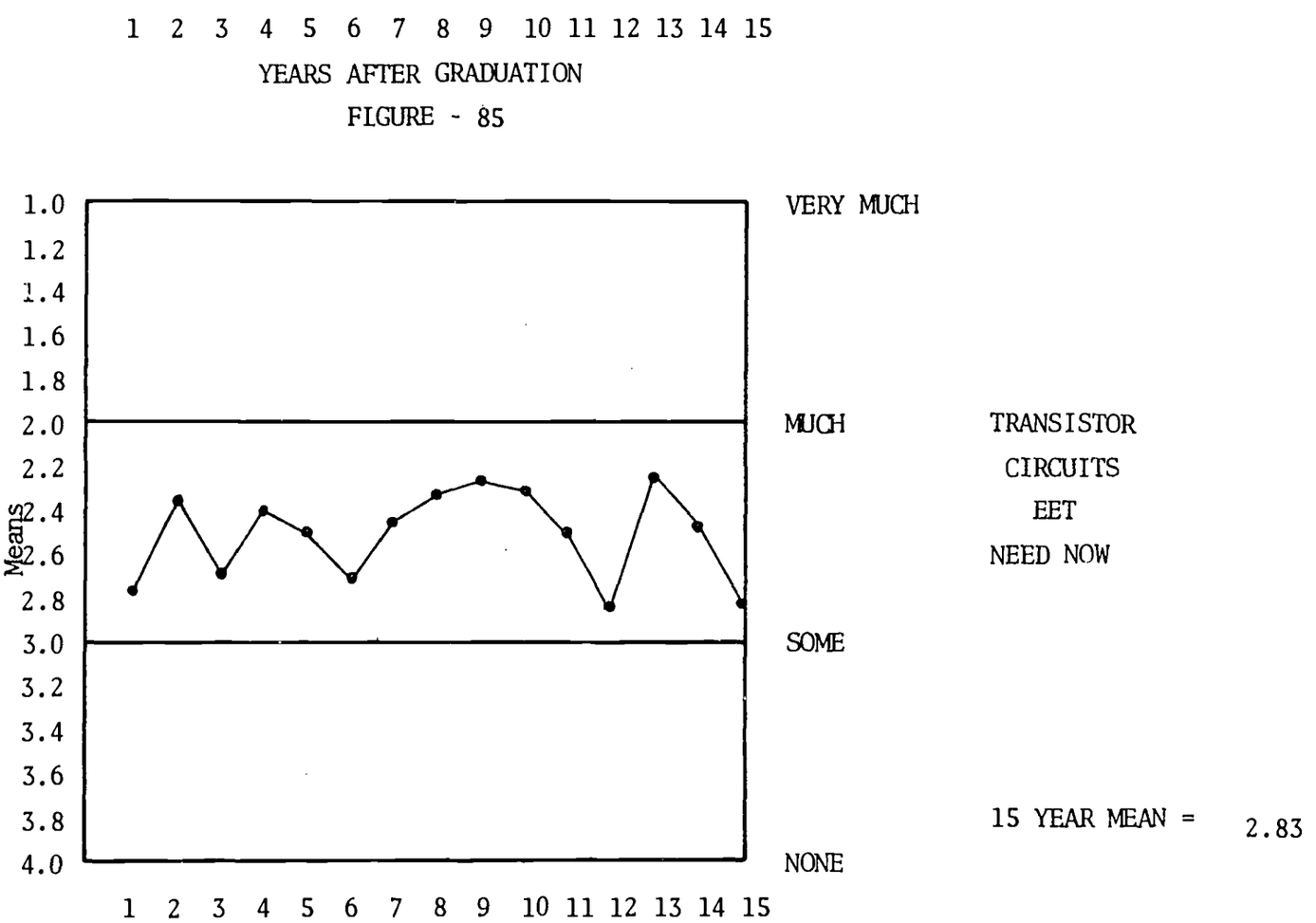
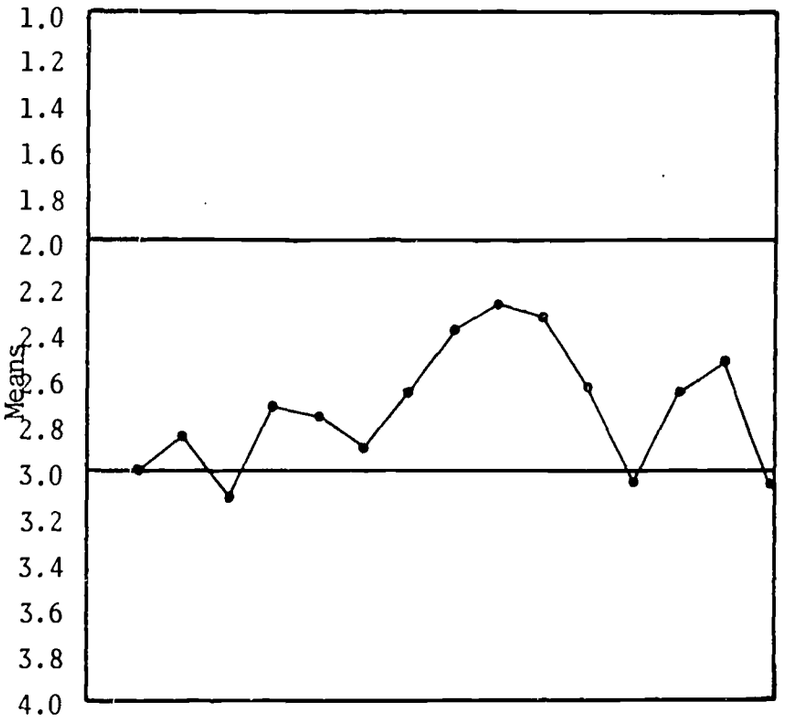


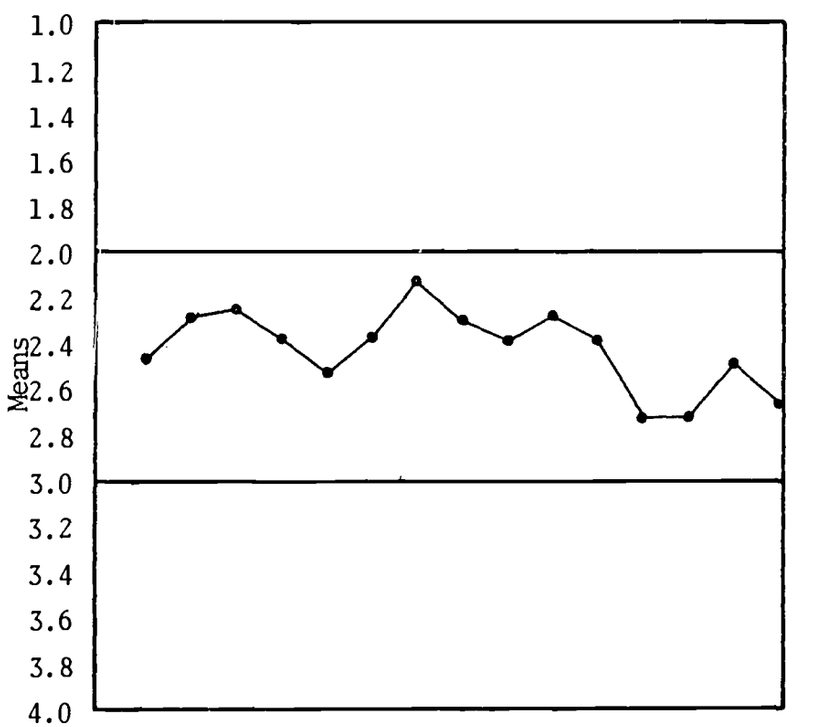
FIGURE - 86



INTEGRATED CIRCUITS EET NEED NOW

15 YEAR MEAN = 3.34

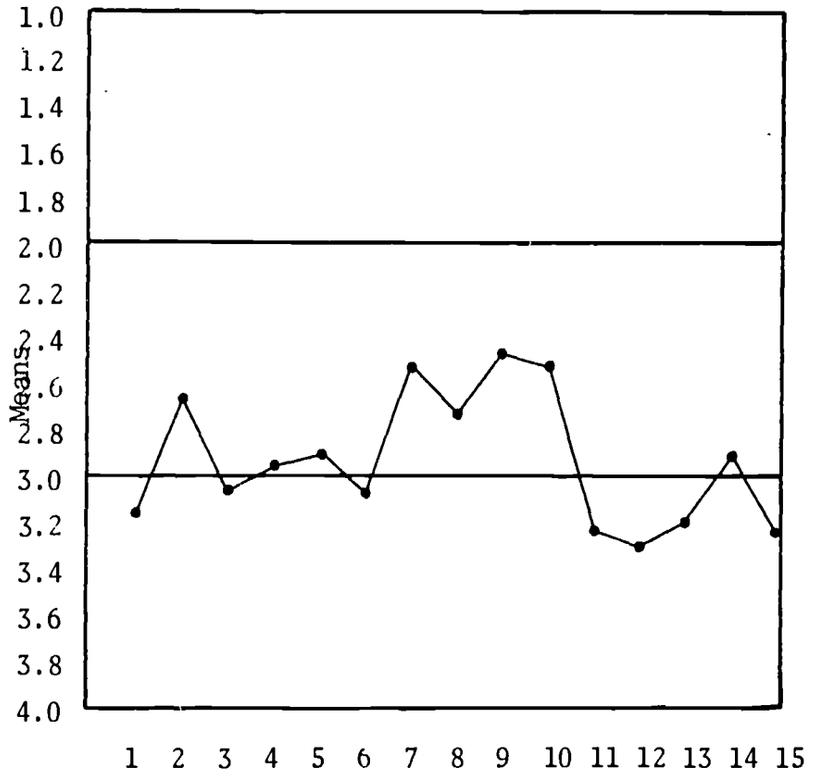
FIGURE - 87



TEST EQUIPMENT EET NEED NOW

15 YEAR MEAN = 2.30

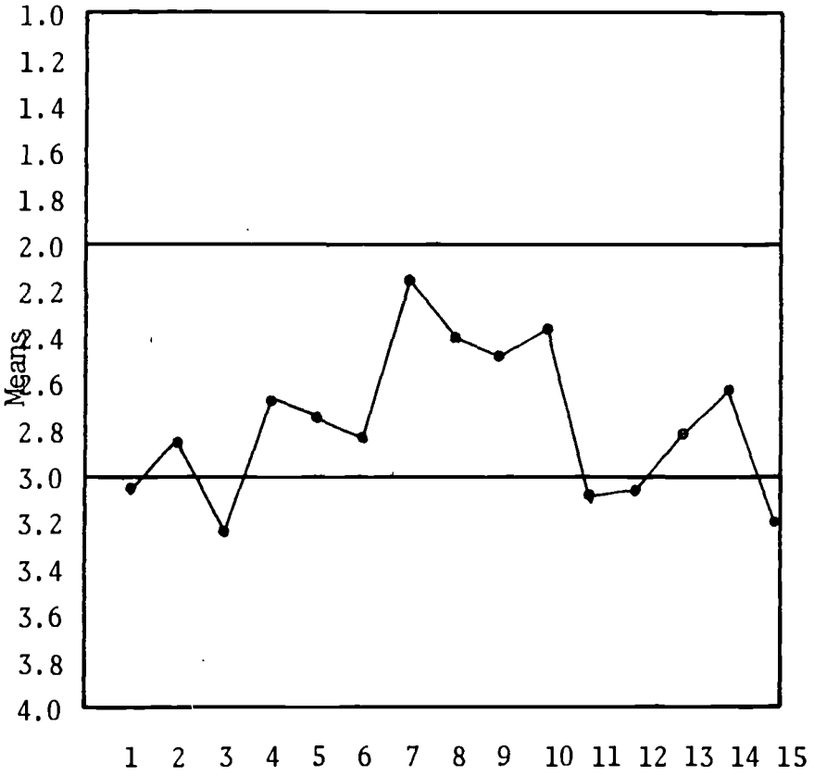
FIGURE - 88



PULSE
CIRCUITS
EET
NEED NOW

15 YEAR MEAN = 3.10

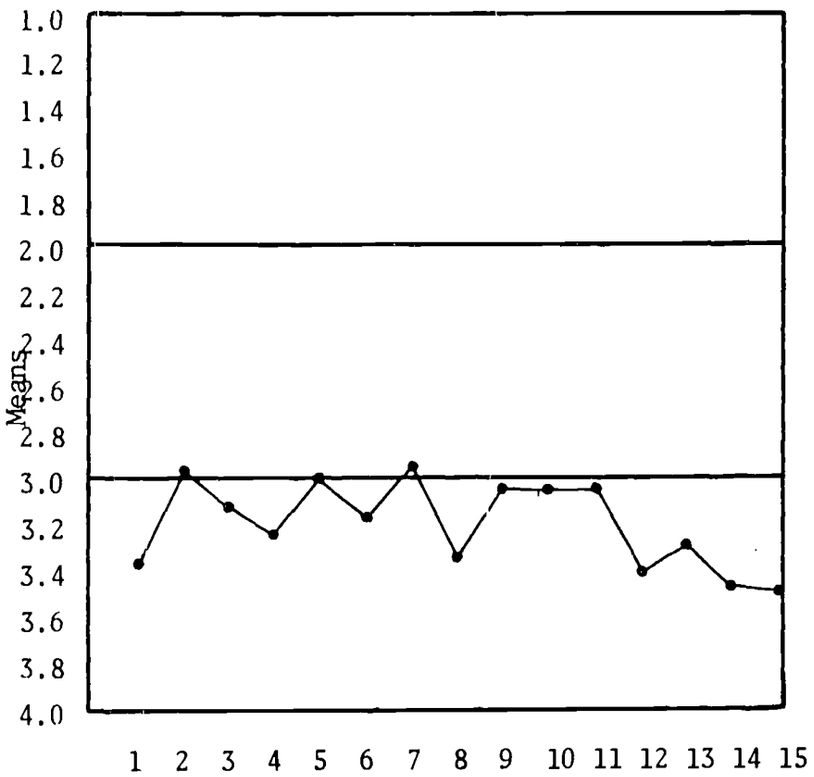
FIGURE - 89



LOGIC
CIRCUITS
EET
NEED NOW

15 YEAR MEAN = 3.20

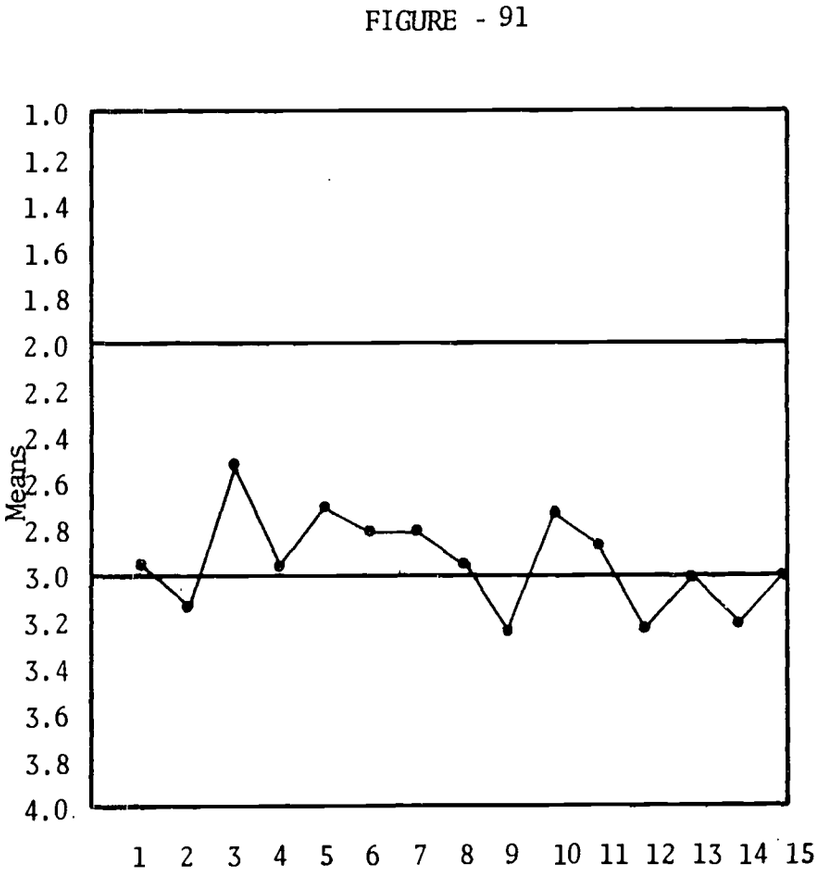
FIGURE - 90



COMMUNICATION
CIRCUITS
EET
NEED NOW

15 YEAR MEAN = 3.27

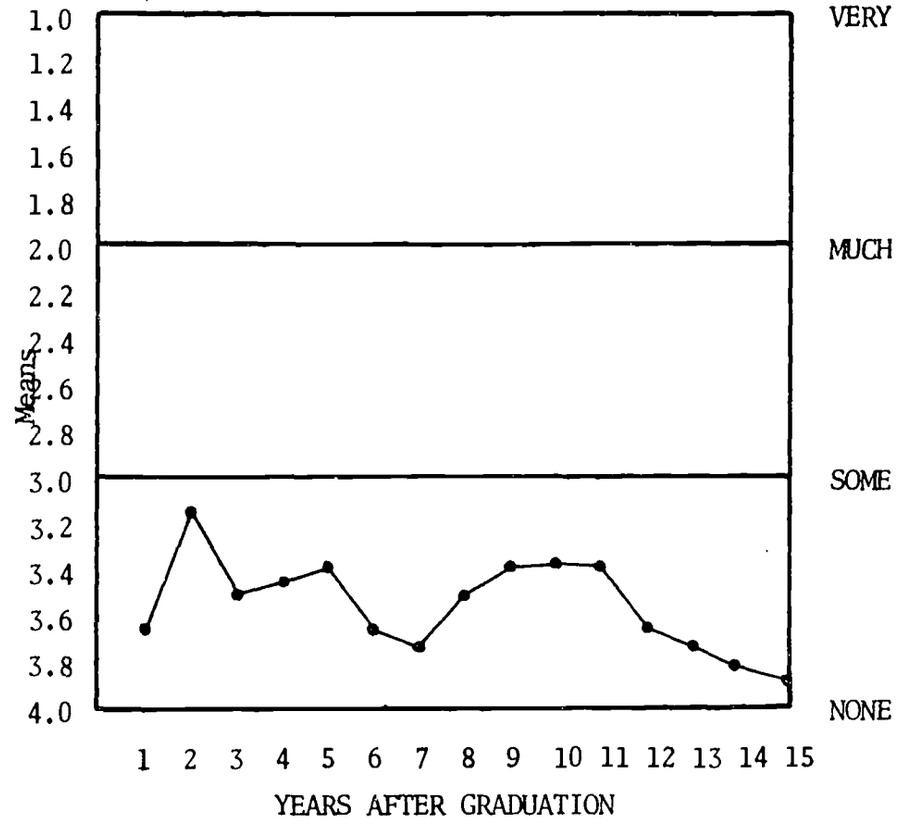
FIGURE - 91



INDUSTRIAL
CIRCUITS
EET
NEED NOW

15 YEAR MEAN = 3.03

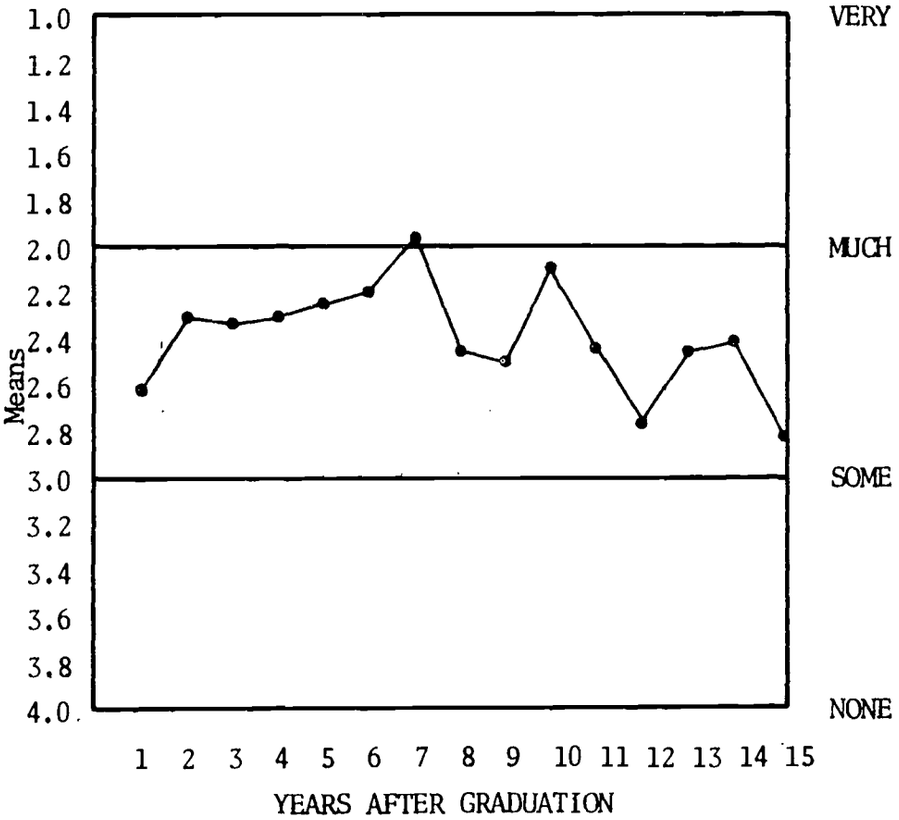
FIGURE - 92



MICROWAVE THEORY EET NEED NOW

15 YEAR MEAN = 3.59

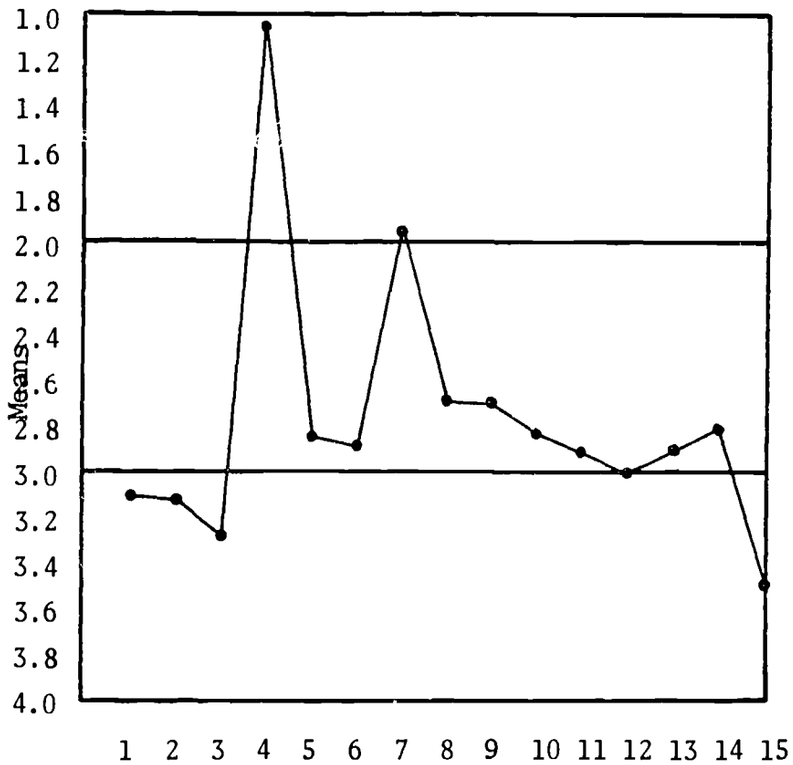
FIGURE - 93



TROUBLE SHOOTING EET NEED NOW

15 YEAR MEAN = 2.40

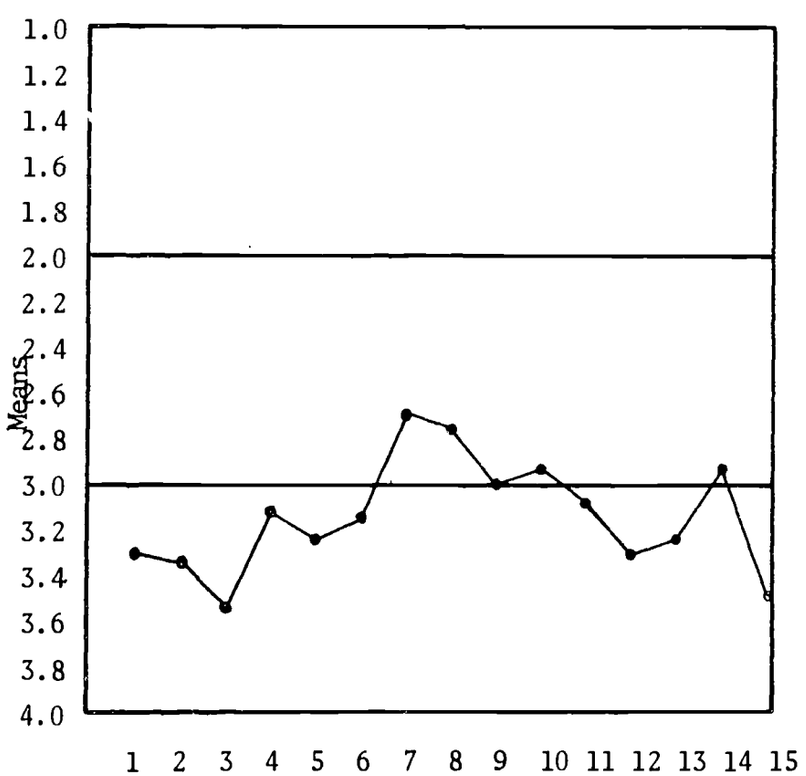
FIGURE - 94



BINARY
ARITHMETIC
EET
NEED NOW

15 YEAR MEAN = 3.26

FIGURE - 95



BOOLEAN
ALGEBRA
EET
NEED NOW

15 YEAR MEAN = 3.48

FIGURE - 96

ANTICIPATED NEED OF COURSEWORK FOR FUTURE JOBS

The respondents were asked to make judgmental responses relative to the Anticipated Future Need for the Basic Coursework. The graduates were asked to judge each of these four items with the value terms of very much, much, some, and none. These in turn were converted into numerical values, from which means by graduation year were computed. The conversions were:

very much = 1

much = 2

some = 3

none = 4

The means for each graduation group by curriculum are graphically displayed in Figures 97 through 104. Tables of Means and Standard Deviations are found in Appendix IV.

As mentioned in preceding sections, the graphs are plotted in such a manner that the means indicating higher ratings (which are numerically smaller) are placed highest on the y-axis. Therefore, the y-axis begins with 4.0 at the origin and numerically decreases to 1.0. The y-axis is then subdivided into the three categories of "very much - much, much - some, some - none" (which are the terms to which the graduates responded to in the questionnaire). Therefore, "1" represents the graduation class of 1969 and "15" represents the graduation group of 1955.

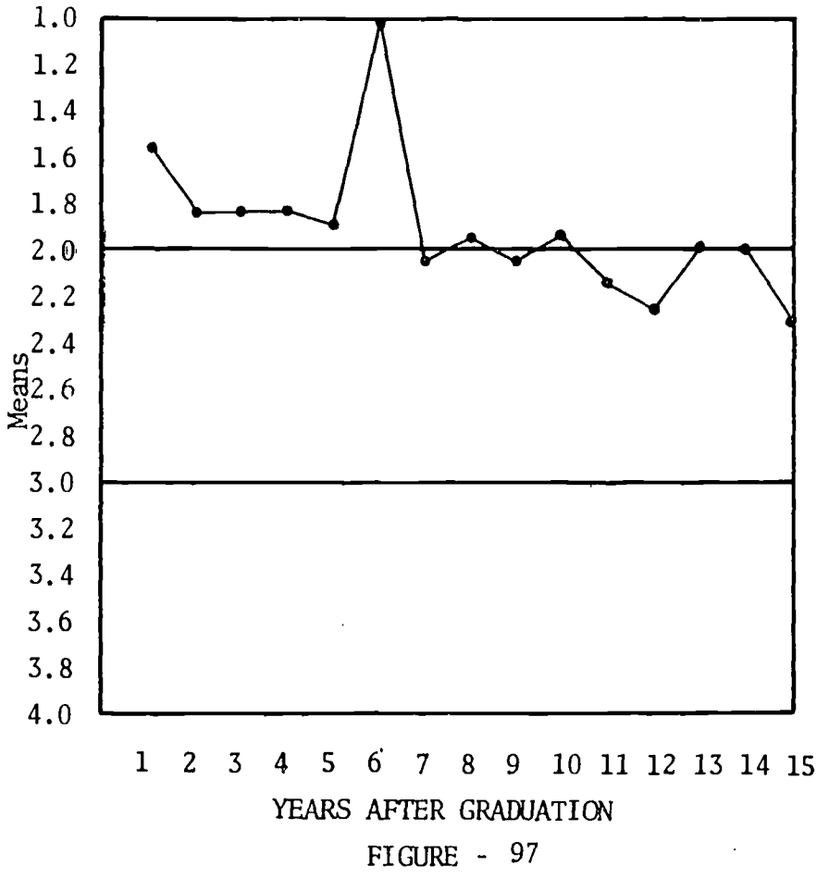
The following paragraphs describe the findings for Anticipated Future Need for the Four basic courses.

Basic Courses - DDT: The Anticipated Future Need values assigned to the four basic courses by the graduates of the DDT program by the fifteen classes are displayed in Figures 98, 100, 102, and 104.

There was a discernible downward trend (older graduates placed lower values) on the Anticipated Future Need for Mathematics, although all but one of the values were in the "very much - much" range. No observable trend was found for Science, with all values falling within the "much - some" region. Anticipated Future Need for English displayed an upward trend (older graduates rating it more highly), with most of the ratings in the "very much - much" category. The same upward trend was found for Social Sciences, with values in the "much to some" region.

Basic Courses - EET: The Anticipated Future Need values assigned to the four basic courses by the graduates of the EET curriculum by the fifteen graduation groups are displayed in Figures 97, 99, 101, and 103.

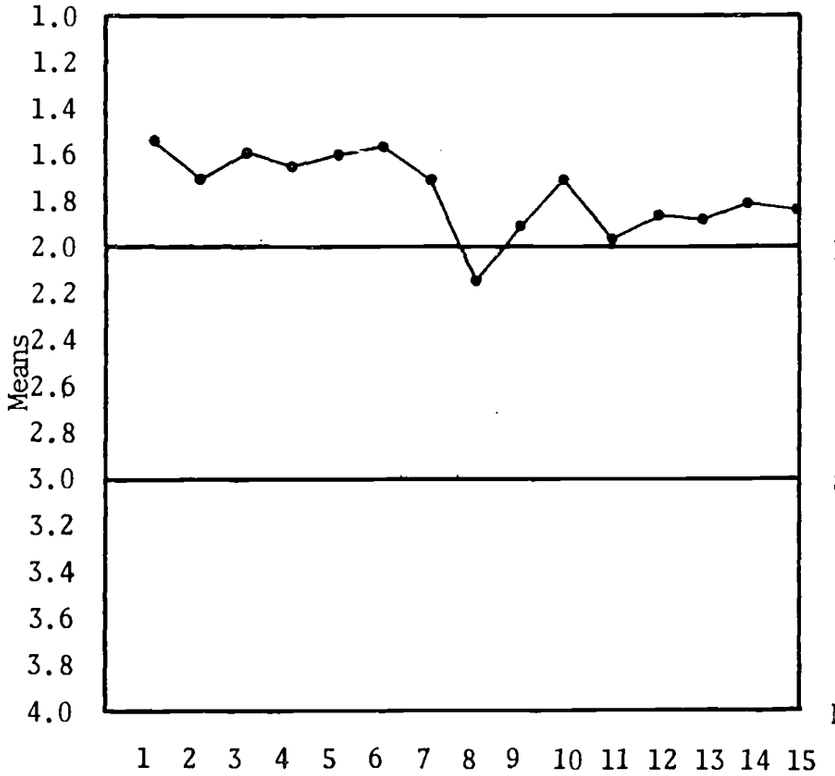
A clear downward trend (rated lower by the older graduation groups) was observed for Mathematics Anticipated Future Need. The more recent groups rated it in the "very much to much" region while the older classes placed it in the "much to some" region. The ratings for Science displayed no upward or downward trend, with values falling in the "much to some" region. English Anticipated Future Need had an upward trend, and all but one of the values fell within the "very much to much" region. An upward trend was also found for Social Sciences and all values fell within the "much to some" category.



MATHEMATICS
EET
ANTICIPATED
FUTURE NEED

15 YEAR MEAN = 1.92

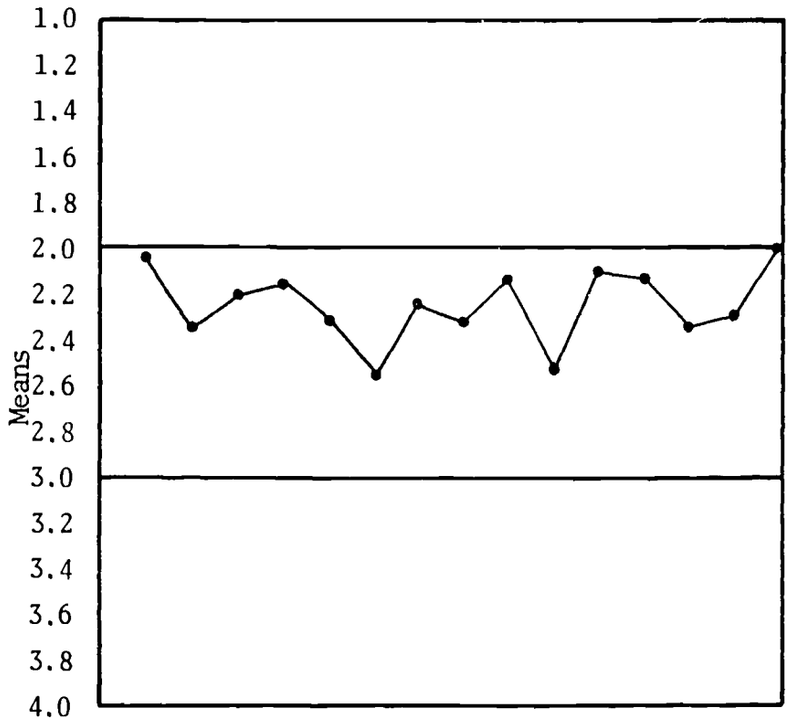
FIGURE - 97



MATHEMATICS
DDT
ANTICIPATED
FUTURE NEED

15 YEAR MEAN = 1.74

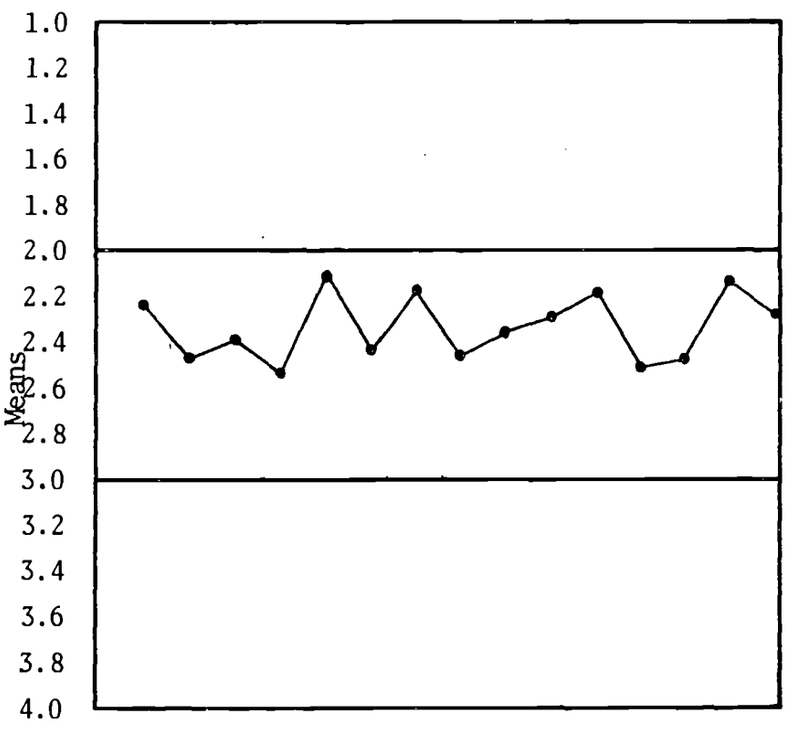
FIGURE - 98



SCIENCE
EET
ANTICIPATED
FUTURE NEED

15 YEAR MEAN = 2.24

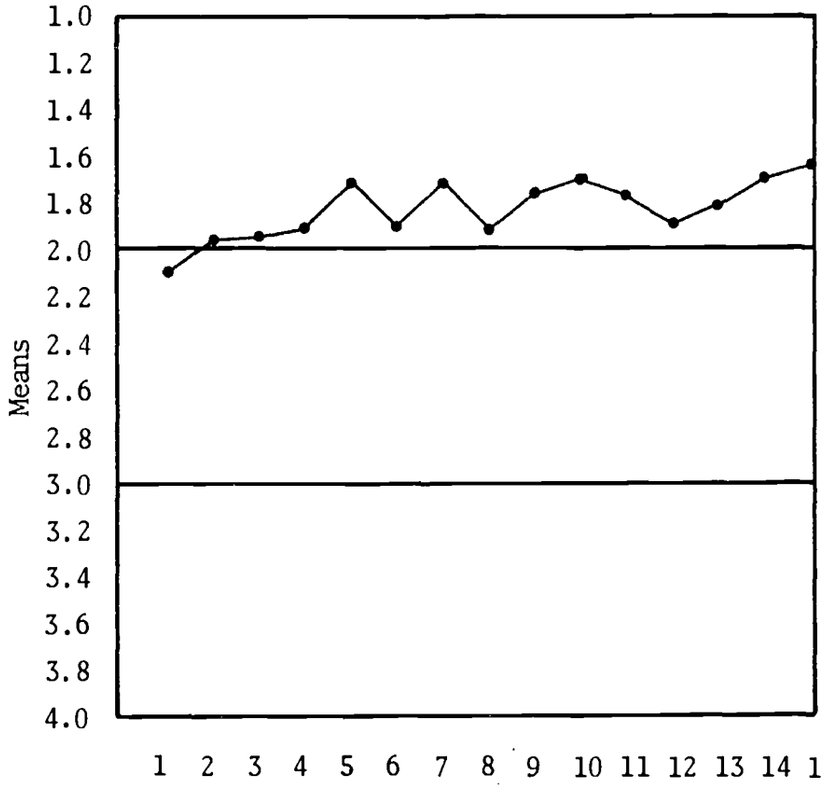
FIGURE - 99



SCIENCE
DDT
ANTICIPATED
FUTURE NEED

15 YEAR MEAN = 2.33

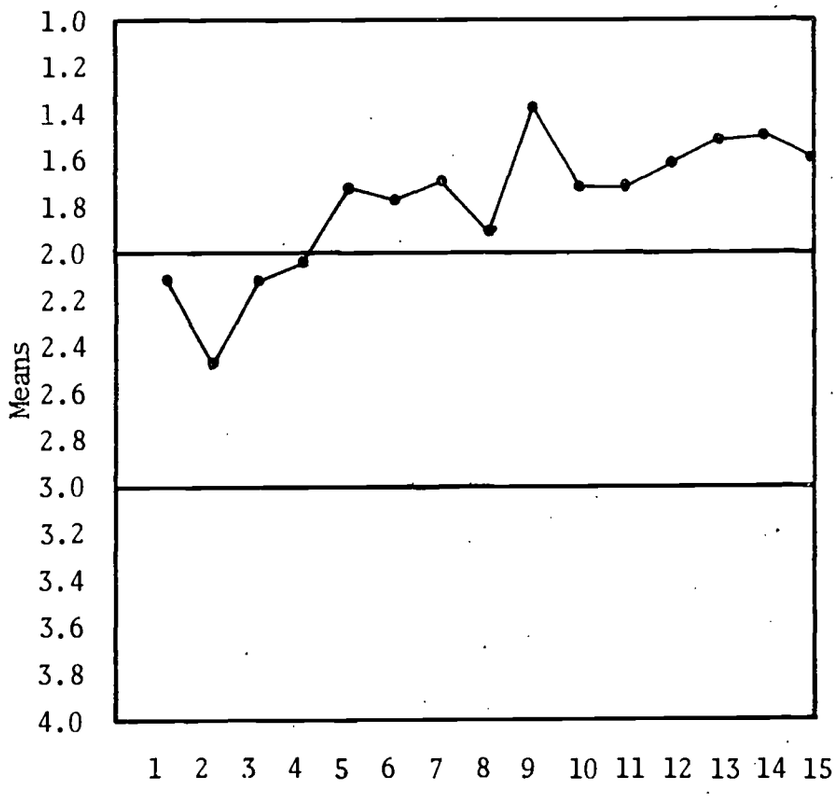
FIGURE - 100



ENGLISH
EET
ANTICIPATED
FUTURE NEED

15 YEAR MEAN = 1.87

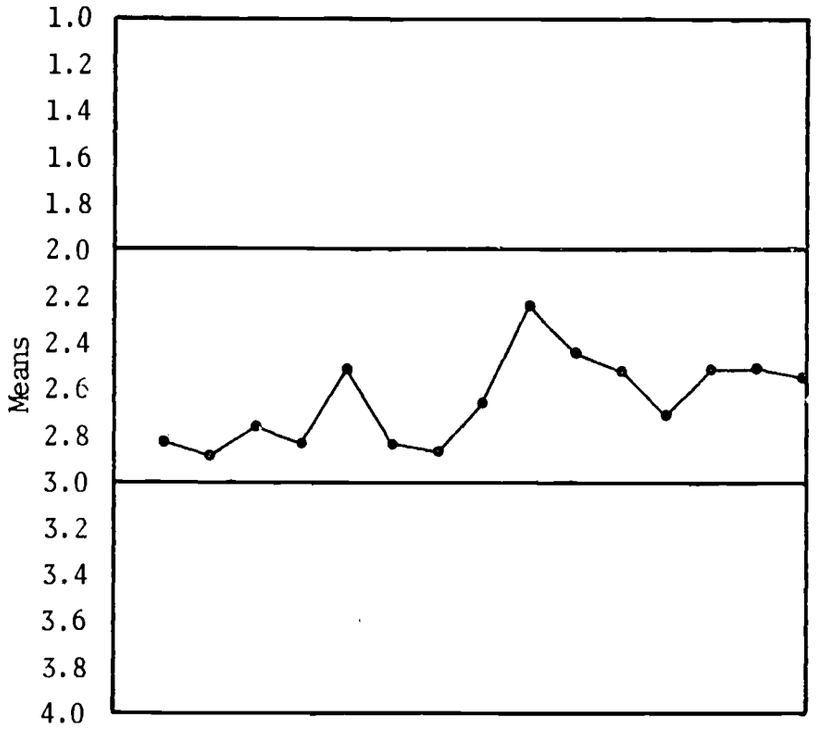
FIGURE - 101



ENGLISH
DDT
ANTICIPATED
FUTURE NEED

15 YEAR MEAN = 1.82

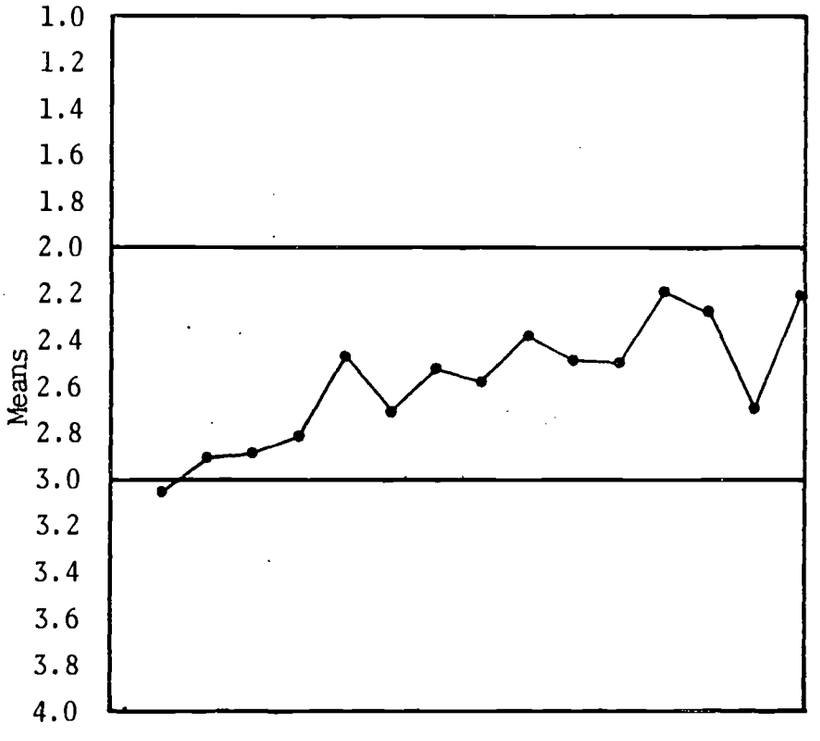
FIGURE - 102



SOCIAL SCIENCE
EET
ANTICIPATED
FUTURE NEED

15 YEAR MEAN = 2.70

FIGURE - 103



SOCIAL SCIENCE
DDT
ANTICIPATED
FUTURE NEED

15 YEAR MEAN = 2.63

FIGURE - 104

INTERRELATIONSHIPS BETWEEN SEVERAL FACTORS

In this section, the interrelationships between Quality of Instruction, Immediate Need after Graduation, and Need Now will be examined. Zero-order correlations are utilized in this brief analysis. It should be pointed out that zero-order correlations indicate the relationship between two variables while not partialing out the effect of other variables upon the relationship. Therefore, zero-order correlations are used as indicators only.

Quality of Instruction and Need Immediately After Graduation: It is seen from Table 1 that the majority of the correlations are significant at the .05 level, but they are not impressively high. Because of the initial relatedness between the two ratings of Quality of Instruction and Need Immediately After Graduation, it is arbitrarily assumed that a correlation of at least 0.500 would be needed to merit special attention. The only topic in which the zero order correlation exceed this value is for Social Science for both curriculums (DDT and EET), which indicates a high degree of congruency between ratings given for Quality of Instruction and Need Immediately after Graduation.

Quality of Instruction and Need Now: Values exceeding 0.500 were found for Social Sciences (EET) and Product Design (DDT). As stated earlier, this indicates a high degree of congruency between Quality of Instruction and Need Now ratings for these two topics. The other interrelationships for these two types of ratings were not notably high.

Need Immediately After Graduation and Need Now: Thirteen of the sixteen topics had values greater than 0.500 for the EET group and fifteen of the sixteen for the DDT graduates. This points out the particularly high degree of congruence between ratings for Need Immediately After Graduation and Need Now. Therefore, it is seen that the highest level of congruence was found between these two ratings.

TABLE 1

ZERO-ORDER CORRELATIONS (EET)

Variable	Q.O.I.--Need After Graduation	Q.O.I.. Need Now	Need After Graduation Need Now
Math	.266*	.207*	.649*
Science	.375*	.367*	.753*
English	.365*	.341*	.698*
Social Science	.579*	.519*	.830*
Vacuum Tubes	.283*	.279*	.553*
Transistor Circuits	.179	.073	.479*
Integrated Circuits	.290*	.021	.537*
Test Equipment	.156	.067	.448*
Pulse Circuits	.256*	.106	.478*
Logic Circuits	.235*	.106	.543*
Communication Circuits	.221*	.133	.614*
Industrial Electrical Circuits	.273*	.205*	.656*
Microwave Theory	.384*	.314*	.772*
Trouble Shooting	.232*	.174	.577*
Binary Arithmetic	.268*	.150	.650*
Boolean Algebra	.360*	.234*	.715*

ZERO-ORDER CORRELATIONS (DDT)

Variable	Q.O.I.--Need After Graduation	Q.O.I. Need Now	Need After Graduation Need Now
Math	.220*	.133	.653*
Science	.345*	.329*	.756*
English	.347*	.302*	.705*
Social Science	.541*	.476*	.820*
Sketching	.291*	.093	.448*
Multi-view Layout	.223*	.140	.500*
Graphical Solutions	.265*	.254*	.573*
Kinematics	.270*	.221*	.582*
Strength of Mat'ls.	.147	.155	.452*
Static Load Analysis	.294*	.218*	.527*
Dynamic Load Analysis	.245*	.165	.613*
Analysis of Structures	.258*	.172	.618*
Manufacturing Process	.234*	.076	.549*
Product Design	.317*	.672*	.576*
Report Writing	.210*	.370*	.587*
Computer Programming	.460*	.379*	.767*

* = significant at the .05 level. Non-asterisked values are not significant at the .05 level.

CONCLUSIONS

Some of the basic courses and special topics were rated differently by the older graduating classes than was found to be the case with the more recent graduates. A summary of these results are reported in the following paragraphs.

Quality of Instruction: The older DDT graduation classes tended to rate the Quality of Instruction higher for the following:

a English

b Report Writing

And the older DDT graduation classes tended to rate the Quality of Instruction lower for the following:

a. Layout

b. Kinematics

c. Static Analysis

d. Dynamic Analysis

e. Analysis of Structures

f. Product Design

Turning to the EET graduates, it was found that the older graduation classes tended to rate the Quality of Instruction higher for:

a. English

b. Vacuum Tube Theory

c. Communication Circuits

The older EET graduation classes tended to rate the Quality of Instruction lower for the following:

a Social Science

b. Transistor Circuit Theory

c. Integrated Circuits

d Logic Circuits

e Binary Arithmetic

Need for Coursework Immediately After Graduation: The older DDT graduation classes tended to rate the Need for Coursework Immediately After Graduation higher for the following:

a. Science

b. English

c. Social Science

d Layout

e Strength of Materials

f. Static Analysis

g Dynamic Analysis

h. Product Design

And the older DDT graduation classes tended to rate the Need for Coursework Immediately After Graduation lower for Computer Programming.

Turning to the EET graduates, it was found that the older graduation classes tended to rate the Need for Coursework Immediately After Graduation higher for:

a. Mathematics

b. Science

c. English

d. Social Science

e. Vacuum Tube Theory

f. Test Equipment

g. Industrial Circuits

And the older EET classes tended to rate the Need for Coursework Immediately After Graduation lower for:

a. Transistor Circuit Theory

b. Integrated Circuits

c. Pulse Circuits

d. Logic Circuits

e. Binary Arithmetic

Need for Coursework Now: The older DDT graduation classes tended to rate the Need for Coursework Now higher for:

a. Science

b. English

c. Social Science

d. Sketching

e. Strength of Materials

f. Static Analysis

g. Manufacturing Processes

h. Report Writing

And the older DDT classes tended to rate the Need for Coursework Now lower for none of the topics.

Turning to the EET graduates, it was found that the older graduation classes tended to rate the Need for Coursework Now higher for:

a. English

b. Social Sciences

c. Integrated Circuits

d. Binary Arithmetic

e. Boolean Algebra

And the older EET classes tended to rate the Need for Coursework Now lower for:

a. Test Equipment

b. Communication Circuits

c. Industrial Circuits

d. Microwave Theory

e. Trouble Shooting

Anticipated Need for Future Jobs: The older DDT graduation classes tended to rate Anticipated Need for Future Jobs higher for Social Science and English. There was no differences in ratings as a function of years after graduation for the other two basic courses. The older EET graduation groups also tended to rate the Anticipated Need for Future Jobs higher for Social Science and English; these same groups gave slightly lower ratings for Mathematics.

The interrelationships among the ratings show, by examination of zero-order correlations, that the strongest relationships (i.e. with coefficient of correlation values greater than .500) exist between most of the "Need Immediately After Graduation - Need Now" ratings.

The purpose of this publication is to report these judgmental values of the respondents, their relationships to years after graduation, and interrelationships. No attempt is made at interpretation of these findings because of the nature of the data.

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1. The Pennsylvania State University Bulletin: Associate Degree Programs. 1969-1970. (Volume LXII, Number 4). University Park, Pennsylvania: Department of Publications, The Pennsylvania State University, 1968.

2. Cochran, William G. Sampling Techniques: 2nd Edition, New York: John Wiley and Sons, Inc., 1963.

3. Klugh, Henry E. Statistics: The Essentials for Research, New York: John Wiley and Sons, Inc., 1970.

APPENDICES

YEARS AFTER GRADUATION

FIGURE - 100

APPENDIX I

QUALITY OF INSTRUCTION

MATHEMATICS*
QUALITY OF INSTRUCTION

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	1.85	.55	1.62	.65
1956	1.73	.80	1.88	.60
1957	1.86	.71	1.79	.73
1958	1.91	.59	1.88	.76
1959	2.00	.86	1.74	.64
1960	1.78	.65	1.84	.81
1961	1.96	.77	1.89	.75
1962	2.00	.71	1.86	.64
1963	2.16	.68	1.96	.78
1964	2.11	.73	1.86	.67
1965	2.10	.79	1.89	.63
1966	2.04	.79	2.09	1.00
1967	1.96	.68	2.00	.72
1968	1.93	.83	2.00	.75
1969	1.93	.65	1.91	.75

* The numerical range is from 1 to 4, and the ratings are: 1 = Excellent; 2 = Good; 3 = Fair; 4 = Poor.

TABLE 2

SOCIAL SCIENCE*
QUALITY OF INSTRUCTION

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.56	.73	2.80	.92
1956	2.46	1.13	2.43	.51
1957	2.71	.69	2.11	.57
1958	2.47	.60	2.41	.74
1959	2.65	.88	2.51	.97
1960	2.62	.92	2.60	.76
1961	2.89	.74	2.46	.72
1962	2.75	.80	2.36	.79
1963	2.32	.87	2.57	.68
1964	2.39	.75	2.59	.66
1965	2.34	.85	2.15	.72
1966	2.31	.76	2.52	.79
1967	2.32	.78	2.51	.63
1968	2.41	.65	2.25	.80
1969	2.39	.65	2.46	.84

* The numerical range is from 1 to 4, and the ratings are: 1 = Excellent; 2 = Good; 3 = Fair; 4 = Poor.

TABLE 3

SCIENCE*
QUALITY OF INSTRUCTION

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.40	.52	1.92	.67
1956	1.64	.63	2.33	.72
1957	2.11	.68	2.04	.66
1958	2.17	.56	2.08	.62
1959	2.35	.75	2.17	.77
1960	1.88	.61	2.16	.58
1961	2.32	.72	2.37	.69
1962	2.06	.76	2.32	.90
1963	2.03	.59	2.24	.79
1964	2.18	.80	2.26	.92
1965	2.23	.67	2.08	.55
1966	2.11	.68	2.24	.71
1967	2.24	.74	2.17	.73
1968	2.12	.71	2.15	.77
1969	2.15	.68	2.41	.78

* The numerical range is from 1 to 4, and the ratings are: 1 = Excellent; 2 = Good; 3 = Fair; 4 = Poor.

TABLE 4

ENGLISH*
QUALITY OF INSTRUCTION

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.27	.80	1.46	.66
1956	1.87	1.06	1.94	.83
1957	1.59	.67	1.64	.60
1958	1.88	.66	1.75	.60
1959	2.07	.92	1.79	.78
1960	2.10	.74	1.94	.86
1961	2.00	.80	1.78	.58
1962	2.46	.98	1.90	.86
1963	2.13	.75	2.36	.86
1964	1.91	.75	2.17	.66
1965	2.25	.91	2.19	.84
1966	2.02	.77	2.16	.80
1967	2.13	.87	2.17	.73
1968	2.14	.78	2.12	.76
1969	2.23	.79	2.09	.75

* The numerical range is from 1 to 4, and the ratings are: 1 = Excellent; 2 = Good; 3 = Fair; 4 = Poor.

TABLE 5

QUALITY OF INSTRUCTION

Curriculum: D.D.T.

Topic: Sketching			Topic: Layout		Topic: Graphic Solutions	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.23	.83	2.07	.73	2.00	.68
1956	2.36	.67	1.85	.50	2.12	.60
1957	2.26	.86	2.00	.71	2.03	.76
1958	2.22	.79	1.83	.64	1.93	.76
1959	2.29	.83	1.94	.67	2.33	.94
1960	2.35	.80	1.88	.49	2.27	.87
1961	2.17	.56	2.00	.68	2.00	.68
1962	2.44	.92	1.90	.67	2.03	.94
1963	2.46	.75	1.87	.56	2.09	.77
1964	2.00	.73	1.71	.58	1.89	.91
1965	2.20	.74	1.87	.67	1.98	.76
1966	2.23	.77	1.78	.59	2.20	.86
1967	2.20	.76	1.89	.60	2.05	.62
1968	2.14	.80	1.87	.69	1.98	.74
1969	2.23	.78	1.82	.72	1.94	.72

TABLE 6

QUALITY OF INSTRUCTION

Curriculum: D.D.T.

	Topic: Strength of Materials		Topic: Static Analysis		Topic: Kinematics	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	1.92	.76	2.03	.78	2.31	.95
1956	2.00	.71	2.12	.60	2.71	1.05
1957	2.06	.78	2.21	.90	2.35	.95
1958	1.75	.67	2.02	.69	2.33	.90
1959	2.06	.79	2.27	.90	2.44	1.05
1960	2.09	.72	2.16	.64	2.13	.94
1961	1.96	.81	2.19	.69	2.04	.76
1962	2.07	.80	2.07	.72	2.26	.94
1963	2.00	.71	2.17	.72	2.40	.79
1964	2.03	.99	2.00	.96	2.26	.85
1965	2.02	.89	2.02	.76	2.22	.88
1966	2.04	.94	2.19	.82	2.30	.92
1967	1.92	.72	2.15	.69	2.06	.73
1968	2.08	.84	1.98	.71	2.12	.88
1969	2.15	1.01	2.00	.82	2.31	.94

TABLE 7

QUALITY OF INSTRUCTION

Curriculum: D.D.T.

Topic: Analysis of Structures			Topic: Manufacturing Process		Topic: Dynamic Analysis	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.42	.67	2.00	.77	2.45	.82
1956	2.06	.68	2.31	1.01	2.19	.54
1957	2.17	.93	2.36	.74	2.28	.98
1958	2.09	.77	2.35	.95	2.31	.78
1959	2.29	.89	2.24	.90	2.56	.99
1960	2.45	.74	2.76	.99	2.50	.78
1961	2.44	.77	2.35	.75	2.52	.59
1962	2.31	.79	2.43	.88	2.11	.88
1963	2.19	.71	2.43	.94	2.40	.68
1964	2.03	.83	2.40	.88	2.07	.90
1965	2.00	.74	2.15	.81	2.33	.76
1966	2.21	.90	2.42	.94	2.49	.84
1967	2.21	.88	2.49	.72	2.35	.77
1968	1.86	.74	2.28	.90	2.12	.65
1969	1.93	.84	2.11	.83	2.18	.85

TABLE 8

QUALITY OF INSTRUCTION

Curriculum: D.D.T.

Topic: Computer Programming			Topic: Report Writing		Topic: Product Design	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	0.00	.0	2.17	.72	2.25	.45
1956	0.00	.0	2.33	.89	2.46	.78
1957	0.00	.0	2.22	.80	2.52	.87
1958	0.00	.0	2.34	.91	2.39	.86
1959	0.00	.0	2.38	.98	2.23	.84
1960	0.00	.0	2.86	.96	2.38	.91
1961	0.00	.0	2.74	1.04	2.40	.65
1962	0.00	.0	2.57	.85	2.07	.83
1963	0.00	.0	2.97	.76	2.40	.90
1964	0.00	.0	2.56	.92	2.33	1.04
1965	3.05	.97	2.49	1.00	2.25	.81
1966	3.13	1.36	2.84	.95	2.38	.96
1967	2.93	1.00	2.74	.85	2.33	.69
1968	2.94	1.07	2.69	.92	2.15	.83
1969	3.00	.91	2.72	.81	2.19	.90

TABLE 9

QUALITY OF INSTRUCTION

Curriculum: E.E.T.						
Topic: Binary Arithmetic			Topic: Boolean Algebra		Topic: Trouble Shooting	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	0.00	.0	0.00	.0	2.50	.55
1956	0.00	.0	0.00	.0	2.22	.83
1957	0.00	.0	0.00	.0	2.47	1.06
1958	0.00	.0	0.00	.0	2.91	.89
1959	2.89	1.05	0.00	.0	2.85	.99
1960	2.30	.67	2.63	.92	2.75	.75
1961	2.79	.97	2.33	1.02	2.71	.61
1962	1.88	.35	0.00	.0	2.78	.85
1963	2.50	.81	2.69	.75	2.91	1.00
1964	2.74	.86	2.72	1.09	2.84	.94
1965	2.47	.86	2.90	.79	2.71	1.12
1966	2.33	.96	2.50	.91	2.54	.90
1967	2.76	.83	3.06	.97	2.66	.97
1968	2.76	.83	2.57	.96	3.02	.94
1969	2.20	.88	2.26	.94	2.50	1.02

TABLE 10

QUALITY OF INSTRUCTION

Curriculum: E.E.T.						
Topic: Vacuum Tubes			Topic: Transistor Circuits		Topic: Integrated Circuits	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.06	.77	0.00	.0	0.00	0.00
1956	1.60	.63	0.00	.0	0.00	0.00
1957	1.71	.78	0.00	.0	0.00	0.00
1958	1.94	.80	2.30	.82	0.00	0.00
1959	2.15	.95	3.07	.88	2.86	.90
1960	2.18	.60	2.93	.81	2.67	.71
1961	2.09	.60	2.41	.91	2.50	1.05
1962	2.06	.74	2.94	.93	2.89	1.05
1963	1.87	.67	2.42	.85	2.67	.98
1964	2.12	.69	2.44	.93	3.00	.82
1965	2.08	.75	2.59	.85	2.60	.94
1966	2.25	.72	2.34	.79	2.78	.93
1967	1.89	.63	2.06	.89	2.42	.90
1968	2.14	.81	1.98	.88	2.44	.94
1969	2.20	.93	1.57	.65	2.11	.95

TABLE 11

QUALITY OF INSTRUCTION

Curriculum: E.E.T.

Topic: Pulse Circuits			Topic: Logic Circuits		Topic: Test Equipment	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	0.00	.0	0.00	.0	2.20	.94
1956	0.00	.0	0.00	.0	2.20	.68
1957	0.00	.0	0.00	.0	2.19	.75
1958	2.11	.33	0.00	.0	2.43	.77
1959	2.43	.79	0.00	.0	2.44	.87
1960	2.40	.63	2.64	.67	2.32	.84
1961	3.08	.49	3.00	.76	2.48	.87
1962	2.88	.86	2.50	.84	2.34	.79
1963	2.80	.70	2.79	.83	2.61	.84
1964	3.00	.62	2.90	.70	2.50	.96
1965	2.62	.85	2.73	.90	2.26	.79
1966	2.57	.80	2.74	.95	2.36	.91
1967	2.25	.84	2.47	.93	2.17	.94
1968	2.41	.84	2.49	.82	2.19	.81
1969	1.96	.78	1.90	.84	1.74	.76

TABLE 12

QUALITY OF INSTRUCTION

Curriculum: E.E.T.						
Topic: Communication Circuits			Topic: Industrial Circuits		Topic: Microwave Theory	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.50	.55	2.28	.61	0.00	0.00
1956	2.18	.87	2.07	.83	0.00	0.00
1957	2.56	.78	2.14	.91	0.00	0.00
1958	2.35	.78	2.40	.86	0.00	0.00
1959	2.58	.88	2.48	.77	3.00	.82
1960	2.46	.82	2.38	.78	3.00	1.00
1961	2.78	.80	2.38	.74	2.75	.71
1962	2.50	.57	2.55	.75	2.50	.53
1963	2.72	.74	2.50	.69	2.83	.98
1964	2.97	.71	2.77	.72	3.23	.73
1965	2.93	.81	2.28	.80	3.18	.81
1966	2.64	.80	2.23	.71	2.94	.80
1967	2.55	.99	2.42	.82	2.53	.99
1968	2.93	.94	2.42	.81	2.82	.96
1969	2.63	1.04	2.22	.83	2.66	.97

TABLE 13

APPENDIX II

NEED IMMEDIATELY AFTER GRADUATION

MATHEMATICS*
NEED IMMEDIATELY AFTER GRADUATION

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	1.92	.76	2.00	.88
1956	2.00	.85	1.82	.88
1957	2.00	.87	1.59	.74
1958	2.09	.98	1.75	.86
1959	2.21	.88	1.86	.82
1960	2.13	.88	1.84	.81
1961	2.22	.90	1.82	.94
1962	2.30	.97	2.38	.82
1963	2.29	.82	1.91	.84
1964	2.41	.96	1.73	.87
1965	2.10	.90	1.75	.87
1966	2.08	.88	1.77	.80
1967	2.23	.86	1.83	.85
1968	2.34	.90	2.00	.75
1969	2.22	.93	1.96	.84

* The numerical range is from 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 14

SCIENCE*
NEED IMMEDIATELY AFTER GRADUATION

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.30	.95	2.23	.93
1956	2.33	1.05	2.81	.91
1957	2.39	.85	2.52	1.01
1958	2.11	.99	2.48	.94
1959	2.46	.90	2.54	.85
1960	2.33	.83	2.59	.98
1961	2.36	1.05	2.43	.92
1962	2.51	.85	2.89	.69
1963	2.45	.85	2.71	.86
1964	2.71	.91	2.74	.82
1965	2.45	1.01	2.66	.83
1966	2.54	.98	2.71	.97
1967	2.61	.88	2.76	.67
1968	2.76	.95	2.95	.89
1969	2.42	.88	2.73	.88

* The numerical range is from 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 15

ENGLISH*
NEED IMMEDIATELY AFTER GRADUATION

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.00	.76	2.00	.88
1956	1.93	.96	2.24	.92
1957	2.23	.87	2.25	1.02
1958	2.24	.94	2.15	.92
1959	1.96	.79	2.38	.86
1960	2.40	.84	2.25	.92
1961	2.43	.73	2.14	.89
1962	2.56	.88	2.45	1.02
1963	2.16	.82	2.42	.84
1964	2.53	.96	2.46	.93
1965	2.15	.94	2.35	.91
1966	2.33	.94	2.45	.95
1967	2.38	.89	2.44	.84
1968	2.42	.91	2.68	.71
1969	2.51	.86	2.55	.95

* The numerical range is from 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 16

SOCIAL SCIENCE*
NEED IMMEDIATELY AFTER GRADUATION

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	3.00	.67	2.82	1.08
1956	3.00	.85	3.13	.52
1957	3.00	.91	2.95	.85
1958	2.92	.78	2.79	.89
1959	3.00	.90	3.19	.51
1960	3.11	.74	3.07	.84
1961	3.11	.66	3.04	.69
1962	3.12	.55	3.13	.69
1963	3.10	.65	3.25	.83
1964	3.12	.86	3.17	.66
1965	3.21	.83	3.04	.79
1966	3.22	.85	3.18	.84
1967	3.30	.62	3.35	.64
1968	3.34	.76	3.33	.70
1969	3.15	.75	3.36	.67

* The numerical range is from 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 17

USE IMMEDIATELY AFTER GRADUATION

Curriculum: D.D.T.						
Topic: Sketching			Topic: Layout		Topic: Graphic Solutions	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.57	.85	1.71	.83	2.71	.91
1956	2.67	1.14	1.94	1.06	3.22	1.00
1957	2.42	1.09	2.06	1.10	3.09	.87
1958	2.60	1.01	2.15	1.09	3.00	.91
1959	2.62	.97	2.04	.93	2.96	1.07
1960	2.75	1.08	2.21	1.17	3.19	.95
1961	2.64	.87	1.79	.88	3.07	.86
1962	2.71	.66	2.03	1.02	3.14	.92
1963	2.67	.90	1.98	.93	3.34	.65
1964	2.58	1.02	2.24	1.09	2.97	.69
1965	2.42	.93	1.95	.93	2.87	.91
1966	2.57	1.00	2.20	1.11	3.07	.90
1967	2.40	.89	2.11	1.06	3.09	.91
1968	2.69	.90	2.52	1.06	3.18	.85
1969	2.77	.86	2.32	1.13	3.08	.91

TABLE 18

Curriculum: D.D.T.

Topic: Strength of Materials			Topic: Static Analysis		Topic: Kinematics	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.57	1.02	2.86	1.03	3.14	.66
1956	2.67	.97	3.33	.69	3.39	.69
1957	2.29	.94	2.85	1.03	3.06	.81
1958	2.73	1.05	2.96	.97	3.31	.72
1959	2.74	1.12	2.98	1.09	3.26	.98
1960	3.15	.87	3.25	.72	3.34	.79
1961	3.00	.90	3.53	.85	3.43	.74
1962	3.31	.71	3.45	.69	3.54	.74
1963	3.05	.82	3.37	.77	3.60	.53
1964	2.84	.73	3.08	.87	3.41	.64
1965	2.73	.85	3.13	.72	3.31	66
1966	2.73	.85	3.00	.94	3.05	.87
1967	2.91	.89	3.13	.86	3.20	.72
1968	3.02	1.03	3.32	.81	3.28	.88
1969	2.94	1.04	3.24	.99	3.40	.86

TABLE 19

USE IMMEDIATELY AFTER GRADUATION

Curriculum: D.D.T.						
Topic: Dynamic Analysis			Topic: Analysis of Structures		Topic: Manufacturing Process	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	3.07	1.07	3.07	1.07	2.93	.92
1956	3.39	.61	3.61	.61	2.89	1.02
1957	3.18	1.01	2.94	1.06	3.06	.85
1958	3.32	.86	3.19	.89	2.87	1.03
1959	3.16	.96	2.99	1.06	2.81	1.10
1960	3.47	.67	3.44	.72	2.91	.96
1961	3.46	.76	3.46	.76	3.00	.72
1962	3.43	.84	3.48	.83	3.04	.74
1963	3.53	.76	3.33	.91	2.92	.92
1964	3.24	.85	2.92	1.08	2.86	1.03
1965	3.26	.71	3.11	.93	2.78	1.06
1966	3.17	.91	3.23	1.00	2.86	.97
1967	3.26	.85	3.13	.98	2.87	.88
1968	3.39	.85	3.16	.85	3.25	.89
1969	3.34	.87	3.23	.96	3.02	1.02

TABLE 20

USE IMMEDIATELY AFTER GRADUATION

Curriculum: D.D.T.						
Topic: Report Writing			Topic: Computer Programming		Topic: Product Design	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	3.14	1.10	4.00	0.00	2.50	1.02
1956	3.22	.94	3.83	.51	2.83	1.20
1957	3.09	.98	3.91	.39	3.00	1.02
1958	3.16	.95	3.92	.28	2.88	1.14
1959	3.09	1.06	3.96	.21	2.78	1.05
1960	3.28	.89	3.93	.27	2.68	1.08
1961	3.38	.80	3.78	.52	2.93	.94
1962	3.41	.84	3.83	.39	2.79	.94
1963	3.33	.93	3.61	.84	2.98	.92
1964	3.18	.90	3.80	.61	2.60	1.12
1965	3.19	1.05	3.82	.43	2.72	1.12
1966	3.10	1.05	3.41	1.07	2.91	1.09
1967	3.00	1.04	3.67	.75	2.95	.91
1968	3.37	.88	3.80	.53	3.21	1.02
1969	3.29	1.03	3.73	.67	3.08	.93

TABLE 21

USE IMMEDIATELY AFTER GRADUATION

Curriculum: E.E.T.						
Topic: Vacuum Tubes			Topic: Transistor Circuits		Topic: Integrated Circuits	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.94	.93	3.69	.60	4.00	0.00
1956	2.53	1.30	2.93	1.33	3.20	1.26
1957	2.64	1.04	3.00	.97	3.80	.52
1958	2.70	1.02	3.03	1.09	3.48	.93
1959	2.54	1.10	2.50	1.04	3.43	.84
1960	2.79	1.09	2.69	1.09	3.62	.60
1961	3.17	.83	2.57	1.08	3.24	1.04
1962	3.12	.84	2.64	1.06	3.24	.99
1963	3.10	.76	2.70	1.02	3.59	.73
1964	3.38	.85	2.91	.96	3.53	.84
1965	3.38	.63	2.72	1.07	3.05	1.07
1966	3.34	.67	2.71	1.16	3.80	1.21
1967	3.38	.74	2.77	1.00	3.18	1.02
1968	3.49	.85	3.02	1.13	3.24	1.02
1969	3.59	.64	2.88	1.05	3.13	1.05

TABLE 22

USE IMMEDIATELY AFTER GRADUATION

Curriculum: E.E.T.

Year	Topic: Pulse Circuits Mean	S.D.	Topic: Logic Circuits Mean	S.D.	Topic: Test Equipment Mean	S.D.
1955	3.69	.79	3.94	.25	2.38	.96
1956	3.13	1.25	3.33	1.05	2.53	1.13
1957	3.35	.88	3.45	.94	2.62	1.07
1958	3.23	1.18	3.48	.96	2.36	1.25
1959	2.75	1.24	2.86	1.33	1.75	1.11
1960	2.82	1.04	2.79	1.19	1.97	1.10
1961	2.82	1.14	2.91	1.11	2.00	1.24
1962	3.03	1.03	3.10	1.13	2.12	1.02
1963	3.00	.94	3.00	1.02	2.37	1.07
1964	3.34	.90	3.31	1.00	2.42	1.14
1965	2.70	1.24	2.79	1.28	2.41	1.04
1966	3.02	1.06	3.22	1.36	2.17	1.17
1967	3.11	1.01	3.26	.95	2.13	1.03
1968	3.33	.97	3.48	.90	2.66	1.22
1969	3.22	1.03	3.27	.95	2.52	1.11

TABLE 23

USE IMMEDIATELY AFTER GRADUATION

Curriculum: E.E.T.						
Topic: Communication Circuits			Topic: Industrial Circuits		Topic: Microwave Theory	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	3.56	.73	2.13	.81	3.69	.87
1956	3.13	.99	2.87	1.19	3.80	.56
1957	3.33	.86	2.71	1.01	3.70	.80
1958	2.94	1.12	3.15	1.00	3.48	1.09
1959	3.11	.96	3.14	.85	3.36	1.03
1960	3.00	1.03	2.87	1.07	3.24	1.23
1961	3.09	1.12	3.36	.79	3.43	.86
1962	3.32	.84	3.21	.59	3.57	.73
1963	3.21	.90	3.23	.86	3.79	.69
1964	3.42	.75	2.88	.87	3.80	.60
1965	3.05	1.06	2.68	1.09	3.67	.59
1966	3.25	1.13	3.11	1.05	3.48	1.00
1967	3.38	.81	2.58	1.06	3.65	.61
1968	3.37	.95	3.32	.89	3.60	.70
1969	3.55	.72	3.09	.97	3.69	.62

TABLE 24

USE IMMEDIATELY AFTER GRADUATION

Curriculum: E.E.T.						
Topic: Binary Arithmetic			Topic: Boolean Algebra		Topic: Trouble Shooting	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	3.81	.54	3.81	.54	2.88	1.20
1956	3.47	.92	2.40	1.12	2.40	1.24
1957	3.40	.94	3.60	.82	2.60	.99
1958	3.48	.85	3.81	.54	2.24	1.30
1959	2.75	1.21	3.11	1.26	2.04	1.23
1960	3.22	1.07	3.26	1.07	1.97	1.15
1961	2.76	1.18	2.95	1.10	2.33	1.02
1962	3.47	.68	3.95	.68	2.34	.97
1963	2.87	1.17	3.41	.87	2.17	.97
1964	3.59	.50	3.84	.37	2.39	1.17
1965	3.15	1.09	3.47	.88	2.19	1.21
1966	3.11	1.08	3.41	.99	2.32	1.18
1967	3.30	.88	3.50	.78	2.49	1.12
1968	3.39	.96	3.62	.78	2.75	1.22
1969	3.27	.97	3.40	.92	2.65	1.09

TABLE 25

APPENDIX III

NEED FOR COURSEWORK NOW

MATHEMATICS*
NEED NOW

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.23	1.01	1.86	1.03
1956	2.20	.86	1.76	.90
1957	2.14	.99	1.91	.90
1958	2.25	1.11	1.69	.80
1959	2.21	.98	1.72	.80
1960	1.93	.83	1.81	.97
1961	1.97	.82	1.75	.93
1962	2.11	.88	2.03	.78
1963	2.19	.83	1.74	.76
1964	1.01	1.02	1.41	.64
1965	1.85	.95	1.71	.81
1966	1.81	.88	1.75	.89
1967	2.30	.82	1.73	.78
1968	2.30	.89	1.72	.90
1969	2.18	.96	1.88	.83

* The numerical range is from 1 to 4, and the ratings are:
1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 26

SCIENCE*
NEED NOW

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.00	.87	2.29	1.07
1956	2.53	.83	2.38	.96
1957	2.50	.79	2.52	1.05
1958	2.35	1.13	2.43	.94
1959	2.56	1.05	2.33	.93
1960	2.20	.79	2.63	1.04
1961	2.45	.74	2.43	.84
1962	2.43	.98	2.68	.86
1963	2.45	.89	2.39	.85
1964	2.66	.94	2.43	.95
1965	2.33	1.05	2.53	.89
1966	2.41	.93	2.60	.99
1967	2.46	.91	2.62	.86
1968	2.75	.95	2.95	.91
1969	2.45	.85	2.70	.86

* The numerical range is 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 27

ENGLISH*
NEED NOW

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	1.73	.70	1.79	.70
1956	1.93	1.10	1.83	.73
1957	1.91	.68	1.78	.91
1958	1.89	.89	1.71	.82
1959	1.76	.83	1.87	.85
1960	1.90	.78	1.69	.86
1961	2.00	.74	1.64	.78
1962	2.17	.81	2.00	.93
1963	1.87	.76	1.96	.92
1964	2.06	.88	1.92	.83
1965	2.03	.86	1.93	.86
1966	1.91	.93	2.25	.84
1967	2.19	.89	2.36	.93
1968	2.33	.93	2.56	.80
1969	2.42	.90	2.44	.89

* The numerical range is 1 to 4, and the ratings are 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 28

SOCIAL SCIENCE*
NEED NOW

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.30	.95	2.73	1.10
1956	2.73	.96	2.86	.77
1957	2.83	.92	2.58	1.12
1958	2.75	.90	2.49	.88
1959	2.60	.96	2.65	.83
1960	2.73	.84	2.86	.92
1961	2.58	.69	2.75	1.04
1962	2.88	.78	2.78	1.00
1963	2.97	.84	2.78	.96
1964	2.84	.93	2.80	.93
1965	2.90	.91	2.73	.95
1966	2.91	1.00	3.09	.77
1967	3.11	.79	3.32	.67
1968	3.20	.75	3.24	.75
1969	3.22	.72	3.33	.76

* The numerical range is 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 29

NEED NOW

Curriculum: D.D.T.

Topic: Sketching			Topic: Layout		Topic: Kinematics	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.14	1.10	1.64	1.15	3.21	.70
1956	2.22	.94	2.33	1.33	3.28	.75
1957	2.24	1.09	2.41	1.13	3.26	.86
1958	2.17	1.01	2.36	1.07	3.10	.93
1959	2.11	.98	2.25	1.07	3.14	.90
1960	2.38	1.13	2.82	1.21	3.47	.62
1961	2.11	.99	2.61	1.10	3.21	.88
1962	2.67	.96	2.76	1.09	3.25	.89
1963	1.96	.84	2.36	1.09	3.30	.80
1964	2.33	.96	2.38	1.14	3.24	.68
1965	2.13	1.00	2.37	1.06	3.13	.75
1966	2.51	.96	2.39	1.20	2.89	.89
1967	2.18	.90	2.24	1.07	3.09	.82
1968	2.60	1.05	2.79	1.10	3.21	.90
1969	2.63	.91	2.34	1.19	3.21	.93

TABLE 30

NEED NOW

Curriculum: D.D.T.

Topic: Graphic Solutions			Topic: Strength of Mat'ls		Topic: Static Analysis	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.50	1.16	2.29	1.00	2.64	1.08
1956	3.33	.77	2.33	1.03	3.00	1.03
1957	3.50	.66	2.44	.99	2.97	1.02
1958	2.75	1.02	2.40	1.16	2.81	1.07
1959	2.80	1.06	2.28	1.11	2.64	1.20
1960	3.35	.71	2.85	1.18	3.03	1.08
1961	3.14	.85	2.75	1.00	2.96	.89
1962	3.03	1.09	2.72	1.16	2.97	1.02
1963	3.08	.85	2.32	.96	2.65	1.12
1964	2.97	.83	2.43	1.04	2.58	1.25
1965	2.83	.98	2.65	1.01	3.05	.91
1966	3.00	1.06	2.61	1.04	2.88	1.10
1967	2.69	.90	2.80	.94	2.87	1.05
1968	3.05	1.01	2.95	1.08	3.14	.98
1969	2.89	.98	2.83	1.08	3.10	1.07

TABLE 31

NEED NOW

Curriculum: D.D.T.						
Topic: Dynamic Analysis			Topic: Analysis of Structures		Topic: Product Design	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.86	1.03	2.79	1.31	2.07	1.14
1956	3.06	.87	3.44	.62	2.50	1.10
1957	3.33	.82	2.97	.92	2.62	1.18
1958	3.11	1.05	2.86	1.15	2.56	1.17
1959	2.86	1.17	2.75	1.16	2.12	1.10
1960	3.16	.88	3.19	.90	2.61	1.20
1961	3.08	.98	3.04	1.04	2.68	1.06
1962	3.14	1.04	3.24	1.09	2.52	1.33
1963	2.74	1.06	2.69	1.09	2.44	1.07
1964	2.66	1.19	2.61	1.08	2.40	1.35
1965	3.23	.87	3.06	.97	2.61	1.17
1966	2.98	1.02	3.09	.89	2.69	1.24
1967	3.00	.90	2.91	1.08	2.65	1.09
1968	3.30	.91	3.09	.94	3.20	.99
1969	3.13	1.03	3.08	1.08	2.95	.97

TABLE 32

NEED NOW

Curriculum: D.D.T.

Topic: Manufacturing Process			Topic: Computer Prog.		Topic: Report Writing	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.36	1.09	3.83	.39	2.21	.39
1956	2.50	.86	3.44	.70	2.22	.70
1957	2.32	1.07	3.36	1.03	2.21	1.03
1958	2.19	1.10	3.49	.80	1.87	.80
1959	2.11	1.13	3.49	.93	2.11	.93
1960	2.70	1.64	2.89	1.13	1.97	1.13
1961	2.44	1.01	3.09	1.12	2.31	1.12
1962	2.82	1.12	3.13	1.29	2.44	1.29
1963	2.26	1.08	3.20	.96	2.20	.96
1964	2.46	1.08	3.35	.95	2.29	.95
1965	2.28	.97	3.61	.78	2.42	.78
1966	2.63	.89	3.26	1.05	2.55	1.05
1967	2.80	1.04	3.39	1.02	2.70	1.02
1968	3.05	.99	3.73	.60	2.98	.60
1969	3.84	1.05	3.51	.95	2.97	.95

TABLE 33

NEED NOW

Curriculum: E.E.T.						
Topic: Binary Arithmetic			Topic: Boolean Algebra		Topic: Vacuum Tubes	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	3.50	.82	3.50	.82	3.31	.79
1956	2.80	1.37	2.93	1.38	3.53	.83
1957	2.90	1.21	3.25	1.02	3.41	.67
1958	3.00	1.10	3.32	.87	3.55	.79
1959	2.93	1.01	3.07	1.12	3.26	.97
1960	2.81	1.09	2.94	1.09	3.34	.94
1961	2.67	1.02	3.00	.97	3.43	.95
1962	2.67	1.06	2.76	1.09	3.21	.98
1963	1.97	1.19	2.69	1.20	3.33	.71
1964	2.87	1.08	3.16	1.04	3.39	.70
1965	2.82	1.17	3.22	1.07	3.28	.89
1966	1.06	1.10	3.12	1.08	3.30	.88
1967	3.27	.85	3.55	.75	3.26	1.01
1968	3.13	1.12	3.37	.96	3.20	1.03
1969	3.11	1.09	3.29	1.01	3.63	.63

TABLE 34

NEED NOW

Curriculum: E.E.T.						
Topic: Transistor Circuits			Topic: Integrated Circuits		Topic: Test Equipment	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	2.81	1.22	3.06	1.06	2.63	.96
1956	2.47	1.30	2.53	1.46	2.47	1.13
1957	2.24	1.09	2.62	1.07	2.68	.99
1958	2.85	1.18	3.03	1.15	2.73	1.31
1959	2.50	1.11	2.61	1.10	2.39	1.17
1960	2.32	1.23	2.29	1.25	2.26	1.06
1961	2.26	1.21	2.24	1.14	2.39	1.16
1962	2.33	1.24	2.37	1.25	2.27	1.13
1963	2.43	1.22	2.63	1.07	2.10	1.09
1964	2.70	1.13	2.88	1.18	2.38	1.04
1965	2.51	1.14	2.75	1.18	2.54	1.17
1966	2.40	1.24	2.71	1.17	2.37	1.36
1967	2.68	1.07	3.13	.99	2.21	1.06
1968	2.37	1.23	2.84	1.24	2.26	1.28
1969	2.78	1.11	3.00	1.10	2.43	1.21

TABLE 35

Curriculum: E.E.T.

Topic: Pulse Circuits			Topic: Logic Circuits		Topic: Industrial Circuits	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	3.25	1.13	3.19	1.05	3.00	1.03
1956	2.93	1.22	2.60	1.40	3.20	.94
1957	3.20	1.01	2.80	1.11	3.00	.98
1958	3.28	1.14	3.06	1.19	3.21	.93
1959	3.21	.99	3.07	1.12	2.86	1.18
1960	2.50	1.08	2.37	1.17	2.73	1.02
1961	2.46	1.26	2.45	1.26	3.23	.87
1962	2.71	1.22	2.39	1.33	2.97	1.00
1963	2.50	1.17	2.17	1.29	2.80	1.24
1964	3.06	1.09	2.81	1.22	2.80	1.19
1965	2.89	1.15	2.74	1.21	2.71	1.04
1966	2.95	1.76	2.67	1.25	2.98	1.14
1967	3.04	1.10	3.21	1.00	2.51	1.08
1968	2.65	1.17	2.83	1.20	3.14	.98
1969	3.16	1.03	3.03	1.08	2.95	1.00

TABLE 36

NEED NOW

Curriculum: E.E.T.						
Topic: Communication Circuits			Topic: Microwave Theory		Topic: Trouble Shooting	
Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1955	3.50	.73	3.88	.34	2.81	1.28
1956	3.47	.92	3.80	.41	2.40	1.12
1957	3.29	.90	3.74	.73	2.45	1.00
1958	3.41	1.01	3.65	.88	2.75	1.32
1959	3.04	1.00	3.39	1.07	2.42	1.26
1960	3.05	1.05	3.35	1.04	2.08	1.13
1961	3.04	1.19	3.38	.92	2.48	1.12
1962	3.35	.77	3.48	.81	2.44	1.16
1963	2.97	1.15	3.74	.59	1.97	1.09
1964	3.19	1.06	3.66	.71	2.18	1.28
1965	3.00	1.16	3.39	.99	2.22	1.20
1966	3.24	.93	3.43	.95	2.28	1.30
1967	3.13	1.06	3.51	.88	2.33	1.11
1968	2.98	1.09	3.14	1.11	2.30	1.28
1969	3.39	.93	3.65	.63	2.60	1.13

TABLE 37

APPENDIX IV

ANTICIPATED FUTURE NEED FOR COURSEWORK

MATHEMATICS*

ANTICIPATED NEED FOR FUTURE JOBS

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.33	.98	1.82	1.08
1956	2.00	.88	1.80	.86
1957	2.00	.95	1.88	.91
1958	2.25	1.04	1.87	.96
1959	2.17	1.00	1.98	.93
1960	1.95	.80	1.72	.99
1961	2.04	.93	1.93	1.00
1962	1.95	.97	2.15	1.03
1963	2.06	.89	1.71	.76
1964	1.00	1.01	1.56	.84
1965	1.90	.97	1.60	.85
1966	1.81	.88	1.64	.87
1967	1.81	.90	1.60	.84
1968	1.82	.80	1.72	.90
1969	1.55	.72	1.54	.80

* The numerical range is from 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 38

SCIENCE*

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ANTICIPATED NEED FOR FUTURE JOBS

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.00	.87	2.27	1.10
1956	2.29	.83	2.14	.86
1957	2.35	.86	2.46	1.07
1958	2.17	1.05	2.54	.95
1959	2.54	1.03	2.19	.95
1960	2.11	.80	2.28	1.08
1961	2.37	.85	2.37	.88
1962	2.14	.94	2.44	1.05
1963	2.23	.97	2.18	.87
1964	2.55	1.00	2.42	.94
1965	2.29	.98	2.11	.89
1966	2.17	1.06	2.56	.97
1967	2.20	.92	2.40	.86
1968	2.35	.92	2.47	.91
1969	2.03	.88	2.22	.92

* The numerical range is from 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 39

ENGLISH*

ANTICIPATED NEED FOR FUTURE JOBS

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	1.64	.74	1.58	.67
1956	1.71	.91	1.47	.64
1957	1.81	.51	1.52	.81
1958	1.90	.92	1.60	.74
1959	1.79	.86	1.69	.77
1960	1.68	.77	1.69	.93
1961	1.78	.74	1.35	.49
1962	1.92	.87	1.89	1.03
1963	1.72	.73	1.67	.81
1964	1.89	.89	1.75	.81
1965	1.69	.73	1.69	.69
1966	1.91	.89	2.02	.85
1967	1.96	.78	2.13	.97
1968	1.98	.87	2.47	.91
1969	2.09	.73	2.13	.93

* The numerical range is from 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 40

SOCIAL SCIENCE*

ANTICIPATED NEED FOR FUTURE JOBS

Grad. Year	E.E.T.	S.D.	D.D.T.	S.D.
1955	2.56	.73	2.20	1.03
1956	2.50	.94	2.71	.73
1957	2.53	.94	2.26	1.10
1958	2.73	.94	2.19	.94
1959	2.48	1.05	2.48	.86
1960	2.43	.95	2.47	.90
1961	2.21	.71	2.38	1.02
1962	2.64	.82	2.59	1.10
1963	2.87	.88	2.54	.99
1964	2.84	1.00	2.74	.96
1965	2.54	1.00	2.44	.96
1966	2.83	1.00	2.80	.90
1967	2.78	.92	2.87	.92
1968	2.90	.79	2.93	.86
1969	2.82	.83	3.03	.88

* The numerical range is from 1 to 4, and the ratings are: 1 = very much; 2 = much; 3 = some; 4 = none.

TABLE 41

APPENDIX V

COVER LETTER AND QUESTIONNAIRE

The Original Cover Letter:

Dear Penn State Graduate:

The Pennsylvania State University is conducting a follow-up study of the Associate Degree graduates of the Commonwealth Campuses. This study has several major purposes:

1. To learn what has happened to you since you graduated.

2. To learn how you feel about the adequacy of the teaching you received in both the basic and specialized courses.

3. To determine the relationship between your Associate Degree Program and your career.

Your responses, along with those of the other Associate Degree graduates, will serve as a very important part of the evaluation of the Commonwealth Campus curriculums. This evaluation will serve as the basis for recommending changes that could lead to the improvement of the Associate Degree Programs for the benefit of future graduates. Therefore, it can be seen that your help is critically needed.

We have enclosed a short questionnaire for you to fill out. Would you be kind enough to take fifteen minutes or so and answer each question? Also, we request that you be completely honest and direct with your answers.

Upon completing the questionnaire, would you send it back to us in the enclosed pre-addressed envelope?

Thank you for your invaluable assistance. Best wishes.

Sincerely,

Questionnaire - Commonwealth Campus Study:

A. Name _____

B. Graduate from (circle the appropriate program): 1. DDT 2. EET 3. Other

C. Circle the Commonwealth Campus where you received your Associate Degree:

1. Allentown	8. DuBois	15. Schuylkill
2. Altoona	9. Fayette	16. Shenango
3. Beaver	10. Hazleton	17. Wilkes-Barre
4. Behrend	11. McKeesport	18. Worthington-Scranton
5. Berks	12. Mont Alto	19. York
6. Capitol	13. New Kensington	
7 Delaware County	14. Ogontz	

D. Year of graduation from Penn State Associate Degree Program 19 _____

E. Present Address _____
Street Town State Zip

F. Marital Status: Single; Married; Divorced; Separated; Widower
No. of Dependents (Include Spouse) _____

G. Military Experience (circle the appropriate item): 1. Yes 2. No.
3. Overseas 4. Domestic _____ time served (mos.)

Your Work

Information about your first job after earning the Associate Degree:

H. Employer's (Company) Name _____

I. First Job Salary $ _____ per month (before taxes and other deductions)

J. How many miles was your first job from where you lived when you graduated from high school? _____ miles

Information about your present job:

K. Employer's (Company) Name _____

L. Present Job Salary $ _____ per month (before taxes and other deductions)

M. How many miles is your present job from where you lived when you graduated from high school? _____ miles

N. How many times since you received your Associate Degree have you made a job change and a residence change at the same time? _____ times

O. How many jobs with different companies have you held since receiving your Associate Degree? _____ jobs

Circle those items in each list that described some of the things that you do in your job:

A	B	C
1. Copying	1. Supervising	1. Precision Working
2. Synthesizing	2. Serving	2. Tending
3. Comparing	3. Mentoring	3. Driving-Operating
4. Compiling	4. Instructing	4. Setting-Up
5. Coordinating	5. Persuading	5. Handling
6. Computing	6. Negotiating	6. Operating-Controlling
7. Analyzing	6. Speaking-Signaling	7. Manipulating

P. Rank order general groups A, B, and C above in accordance with their importance to your present job.

_____ most important _____ less important _____ least important

Q. Circle the highest degree earned to date:

1. associate 2. bachelors 3. masters 4. doctorate

Your Course Work at Penn State

Following are several items relating to some of the basic courses you took in your Associate Degree Program at The Pennsylvania State University. For each item, "X" the appropriate spaces that best indicate your opinion of the quality of teaching in that subject, the degree to which you used it immediately after graduation, the degree to which you use it now, and its importance in the job you hope to get in the future. Please check one in each column.

SUBJECT	QUALITY OF INSTRUCTION				NEED FOR IT AFTER GRADUATION				YOUR NEED FOR IT NOW				NEED FOR IT TO GET DESIRED JOB IN THE FUTURE			
	Exc.	Good	Fair	Poor	Very Much	Much	Some	None	Very Much	Much	Some	None	Very Much	Much	Some	None
Freshman Mathematics	1___	2___	3___	4___	1___	2___	3___	4___	1___	2___	3___	4___	1___	2___	3___	4___
Freshman Science	1___	2___	3___	4___	1___	2___	3___	4___	1___	2___	3___	4___	1___	2___	3___	4___
English	1___	2___	3___	4___	1___	2___	3___	4___	1___	2___	3___	4___	1___	2___	3___	4___
Social Sciences	1___	2___	3___	4___	1___	2___	3___	4___	1___	2___	3___	4___	1___	2___	3___	4___

III. DDT GRADUATES ONLY

This is the final section of the survey and you are asked to give three responses for each of the items below. These topics deal with some of the major topics in the specialized portion of your Associate Degree Program. You are requested to evaluate them in terms of a) quality of instruction, b) the extent to which you used them immediately after graduation, and c) the extent to which you use them at the present time.

TOPIC	QUALITY OF INSTRUCTION					EXTENT USED WHEN FIRST GRADUATED				EXTENT USED NOW			
	Exc.	Good	Fair	Poor	Not Taught	Very Much	Much	Some	None	Very Much	Much	Some	None
AA Freehand sketching	1	2	3	4	5	1	2	3	4	1	2	3	4
AB Multiview layout	1	2	3	4	5	1	2	3	4	1	2	3	4
AC Graphical solutions	1	2	3	4	5	1	2	3	4	1	2	3	4
AD Kinematics	1	2	3	4	5	1	2	3	4	1	2	3	4
AE Strength of materials	1	2	3	4	5	1	2	3	4	1	2	3	4
AF Static load analysis	1	2	3	4	5	1	2	3	4	1	2	3	4
AG Dynamic load analysis	1	2	3	4	5	1	2	3	4	1	2	3	4
AH Analysis of structures	1	2	3	4	5	1	2	3	4	1	2	3	4
AI Manufacturing process	1	2	3	4	5	1	2	3	4	1	2	3	4
AJ Product design	1	2	3	4	5	1	2	3	4	1	2	3	4
AK Report writing	1	2	3	4	5	1	2	3	4	1	2	3	4
AL Computer programming	1	2	3	4	5	1	2	3	4	1	2	3	4

III. EET GRADUATES ONLY

This is the final section of the survey and you are asked to give three responses for each of the items below. These topics deal with some of the major topics in the specialized portion of your Associate Degree Program. You are requested to evaluate them in terms of a) quality of instruction, b) the extent to which you used them immediately after graduation, and c) the extent to which you use them at the present time.

TOPIC	QUALITY OF INSTRUCTION					EXTENT USED WHEN FIRST GRADUATED				EXTENT USED NOW			
	Exc.	Good	Fair	Poor	Not Taught	Very Much	Much	Some	None	Very Much	Much	Some	None
BA Vacuum tube theory	1	2	3	4	5	1	2	3	4	1	2	3	4
BB Transistor circuit theory	1	2	3	4	5	1	2	3	4	1	2	3	4
BC Integrated circuits	1	2	3	4	5	1	2	3	4	1	2	3	4
BD Use of Electronic test equipment	1	2	3	4	5	1	2	3	4	1	2	3	4
BE Pulse circuits	1	2	3	4	5	1	2	3	4	1	2	3	4
BF Logic circuits	1	2	3	4	5	1	2	3	4	1	2	3	4
BG Communications circuits	1	2	3	4	5	1	2	3	4	1	2	3	4
BH Industrial Electronics circuits	1	2	3	4	5	1	2	3	4	1	2	3	4
BI Microwave theory	1	2	3	4	5	1	2	3	4	1	2	3	4
BJ Trouble-shooting analysis	1	2	3	4	5	1	2	3	4	1	2	3	4
BK Binary Arithmetic	1	2	3	4	5	1	2	3	4	1	2	3	4
BL Boolean Algebra	1	2	3	4	5	1	2	3	4	1	2	3	4

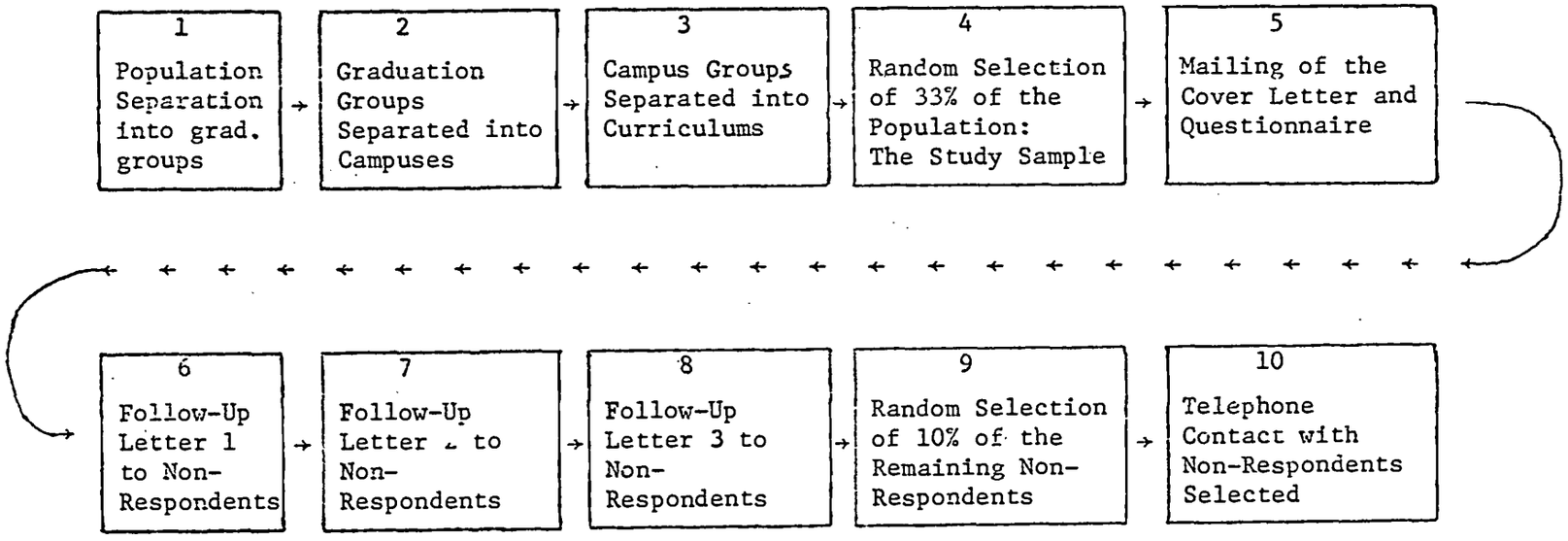
APPENDIX VI

SAMPLE STRATEGY

FIGURE 1

Sampling Strategy

Flow Diagram



APPENDIX VII

SAMPLE DISTRIBUTION

TABLE 1

SAMPLING RESULTS

	Orig. Sample Number	No. of Bad Addresses*	Orig. Respondents Number	Orig. Respondents % of Original Sample	Tel. Sample Number	Tel. Respondents Number	Tel. Respondents % of Follow-up Sample
1955							
DDT	28	7	14	50	-	-	-
EET	40	9	15	38	2	2	100
1956							
DDT	39	7	18	46	1	1	100
EET	29	4	15	52	1	1	100
1957							
DDT	65	12	33	51	2	2	100
EET	46	6	21	46	1	1	100
1958							
DDT	86	8	45	52	4	4	100
EET	52	9	28	54	6	6	100
1959							
DDT	79	10	44	56	5	5	100
EET	62	8	28	45	2	2	100
1960							
DDT	69	16	32	46	3	2	67
EET	76	12	39	51	2	2	100
1961							
DDT	57	10	25	44	3	3	100
EET	49	7	21	43	2	2	100
1962							
DDT	62	8	30	48	2	1	50
EET	64	11	34	53	2	2	100
1963							
DDT	95	10	48	51	7	6	86
EET	79	12	28	35	6	4	67
1964							
DDT	76	7	35	46	3	2	67
EET	63	8	30	48	5	4	80
1965							
DDT	94	7	53	56	2	2	100
EET	78	11	40	51	1	1	100

TABLE 1 (continued)

	Orig. Sample Number	No. of Bad Addresses*	Orig. Respondents Number	% of Original Sample	Tel. Sample Number	Tel. Respondents Number	% of Follow-up Sample
1966							
DDT	86	7	44	51	5	4	80
EET	78	8	46	59	4	4	100
1967							
DDT	75	7	44	58	4	3	75
EET	87	3	46	52	1	1	100
1968							
DDT	95	1	60	63	6	4	67
EET	101	5	54	54	7	6	86
1969							
DDT	94	1	68	72	4	4	100
EET	94	-	67	71	4	3	75
Total							
DDT	1100	118	593	54	51	43	84
EET	998	113	512	51	46	41	89
TOTAL	2098	231	1105	53%	97	84	87%

*Questionnaires returned as undeliverable by the postal authorities.